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ABSTRACT

Designed to serve both as a textbook and as a reference source for instructional developers who wish to keep up with developments in the field, this book presents a broad view of the field of instructional development (ID) together with in-depth descriptions of important new topics and the latest developments in the old ones. The 48 chapters, written by 63 authors, are divided into nine sections and 18 sub-sections according to the stages and management tasks of the ID process: (1) Introduction (ID as a Science or an Art); (2) Strategies (Meta-Theory, Practical Approaches); (3) Tactics (Basis of Design in Theory, Designs, Client-Developer Relations); (4) Logistics (Evaluation, Staff Relations); (5) Diffusion (Theories, Applications); (6) Applications (International, Military, Industry, Public Schools); (7) Personnel (Preparation of the Developers, Women); (8) Futures; and (9) Summary (The State of the Art). The text is supplemented by various tables and figures, references or notes are provided for 43 of 48 chapters, and both author and subject indexes are included. (Author/EW)

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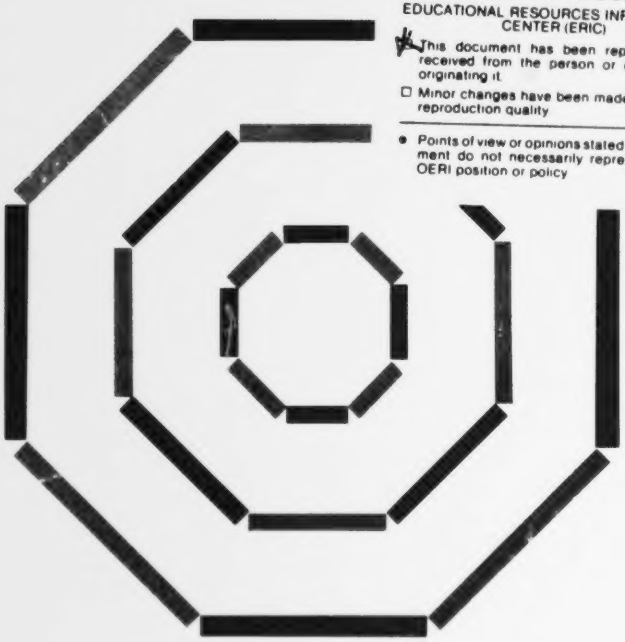

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INSTRUCTIONAL DEVELOPMENT:
The State of the Art, II

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INSTRUCTIONAL DEVELOPMENT:
The State of the Art, II

Edited by:
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Contents

Preface **ix**

Acknowledgments **ix**

I. INTRODUCTION 1

1. Instructional Development: Art? Science? or Both? **1**
    Charles R. Dills
    Ronald K. Bass, University of Florida

II. STRATEGIES 7

A. Meta-Theory 8

2. Instructional Development: Themata, Archetypes, Paradigms and Models **8**
    Ivor Davies, Indiana University

3. Educational Interpretations of General Systems Theory **18**
    William E. Hug, University of Georgia
    James E. King, University of Georgia

4. A Place in Space: ID's Universe **29**
    Roberts A. Braden, Virginia Polytechnic Institute and State University

5. Instructional Development: The Social Implications of Technical Interventions **40**
    Thomas M. Schwenn, Indiana University
    David F. Leitzman, College of St. Benedict
    Earl R. Misanchuk, University of Saskatchewan
    Wellesley R. Foshay, Deltak, Inc., Oakbrook, Illinois
    Kenneth M. Heitland, Indiana University

6. Metamethodology **51**
    Thomas E. Hutchinson, University of Massachusetts

B. Practical Approaches 71

7. A Matter of Survival **71**
    Robert M. Diamond, Syracuse University

8. State of ID Systrems Approach Models **80**
    Madeline J. Trimby, Michigan State University
    Castelle G. Gentry, Michigan State University

9. Interface Analysis of ID Systems **94**
    Castelle G. Gentry, Michigan State University
    Madeline J. Trimby, Michigan State University

III. TACTICS 109

A. Basis of Design in Theory 111

10. Human Interface Processing 111
Robert M. W. Travers, Western Michigan University

11. Knowledge and Its Acquisition: An Introduction and Overview 126
Buford E. Wilson, Governors State University

12. Split-Brain Theory and Recent Results in Brain Research: Implications for the Design of Instruction 139
James D. Hand, University of Arkansas for the Medical Sciences

13. Cognitive Theory within the Framework of an Information Processing Model and Learning Hierarchy: Viable Alternative to the Bloom-Mager System 149
Robert J. Stahl, Arizona State University

B. Designs 169

14. Programmed Instruction to Computer-Based Instruction: The Evolution of an Instructional Technology 169
Joseph P. Lamos, University of Denver

15. Designing an Alternative Teaching Approach (Feedback Lecture) Through the Use of Guided Decision-Making 177
Dean Osterman, Oregon State University

16. Developing Textual Materials: What Research Says to the Practitioner 203
Keith J. Thomas, Arizona State University
Robert J. Stahl, Arizona State University
Charlene C. Swanson, Southern Utah State College

17. What Is Learner Control? 221
M. David Merrill, University of Southern California

18. Student Development: The Next Logical Focus 243
James D. Hand, University of Arkansas for the Medical Sciences

19. Frame Games and Game Chains: A Technology for Interactive Teaching/Learning 250
Harold D. Stolovitch, Universete de Montreal

20. Advance Organizers: Their Construction and Use in Instructional Development 262
John Newell, University of Florida

C. Client-Developer Relations 275

21. Psychological Typologies and the Dynamics of Consultant Relationships 275
William C. Coscarelli, Southern Illinois University
Jerry K. Stonewater, Southern Illinois University

22. The Initial Client Conference: Implications for Continuing Relationship 289
Robert D. Price, University of Arkansas for the Medical Sciences

23. Consultation in Instructional Development: A First Look 294
David P. Rutt, Deltak, Inc., Naperville, Illinois

IV. LOGISTICS 311

A. Evaluation 312

24. Evaluation Dimensions for Program Development and Improvement 312
Eva L. Baker, University of California at Los Angeles

25. Formative Evaluation of Instructional Development 319
Eva L. Baker, University of California at Los Angeles
Marvin C. Alkin, University of California at Los Angeles

26. Naturalistic Inquiry: An Alternative Methodology for Instructional Development Research 333
Sharon A. Shrock, Southern Illinois University

B. Staff Relations 341

27. The Instructional Developer and the Educational Media Production Staff: Relationships and Expectations 341
Lee J. Mullally, University of Florida

V. DIFFUSION 347

A. Theories 348

28. Innovation and Diffusion--An Anthropological View 348
Brian M. du Toit, University of Florida

29. Linking Knowledge Production and Needs of Knowledge Users 359
W. C. Wolf, Jr., University of Massachusetts

30. Evaluating Instructional Development Projects: Guidance from the Literature on Change 380
Joseph J. Durzo, Forum Corporation, Boston, Massachusetts
Barbara M. Florini, Syracuse University

B. Applications 394

31. Faculty Development (FD), Organizational Development (OD), and Instructional Development (ID): Choosing an Orientation 394
Allan J. Abedor, University of Texas School of Allied Health
Steven G. Sachs, Northern Virginia Community College

32. Toward a Faculty Self-Appraisal and Development Program--A Readiness Based Approach 404
Ron J. McBeath, San Jose State University

33. ID in Higher Education: A Paradox 414
William R. Terrell, U.S. Navy, Orlando, Florida
Sharon A. Shrock, Southern Illinois University

34. Promoting the Liberal Arts and Instructional Development 420
Robin E. Lawrason, Temple University

VI. APPLICATIONS 431

A. International 432

35. Some Pointers on Instructional Development in the International Arena 432
John H. Austin, Maxima Corporation, Silver Springs, Maryland
Amy A. Titus, Washington, D.C.

36. Innovation on Command: Instructional Development and Educational Technology in the Soviet Union 441
Stephen T. Kerr, Columbia University

B. Military 457

37. Educational Technology in Military Training Applications: A Current Assessment 457
William A. Platt, Department of Defense, Orlando, Florida
Dee H. Andrews, Department of Defense, Orlando, Florida

38. Instructional System Development in the United States Air Force 470
Hilton D. Goldman, Randolph Air Force Base, Texas

C. Industry 496

39. Industry and Instructional Development 496
Clint Wallington, Rochester Institute of Technology

D. Public Schools 501

40 ID and the LMS: Past, Present, Future 501
Phillip Michael Turner

VII. PERSONNEL 511

A. Preparation of Developers 512

41. Training Instructional Developers: A Review of Current Practice and Directions for the Future 512
Kenneth H. Silber, Governors State University

42. Problems Associated with the Professional Preparation and Certification of Educational Technology Personnel 534
Marvin E. Duncan, North Carolina Central University

43. Training Instructional Designers at Florida State University 545
Walter Dick, Florida State University
Robert M. Morgan, Florida State University

44. Professional Education in Instructional Development at Michigan State University 554
Kent L. Gustafson, University of Georgia
Charles F. Schuller, Longboat Key, Florida

45. The Potential for Professional Certification in the Field of Instructional/Training Design 564
Barry Bratton, University of Iowa

B. Women 570

46. Women and Instructional Development: Patterns of Growth 570
Laurel Dickerson, Data General Corporation, Milford, Massachusetts

VIII. FUTURES 579

47. A Futures Perspective on Instructional Development 579
Carol D. Blalock, University of Florida

IX. SUMMARY 593

48. Instructional Development: The State of the Art 593
Ronald K. Bass, University of Florida
Charles R. Dills

AUTHOR INDEX 599

SUBJECT INDEX 609

Preface

Instructional development as a field is now clearly established. Many people do instructional development. But a better definition is needed as to what instructional development is, what science(s) underlie it, what training instructional developers should have, and where these instructional developers will practice their skills.

Instructional Development: The State of the Art, II is intended to be step two (following Instructional Development: The State of the Art, 1978) toward description of the state of the ID art.

Ronald K. Bass

Charles R. Dills

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I. INTRODUCTION

Chapter 1

Instructional Development: Art? Science? or Both?

Charles R. Dills
Ronald K. Bass

Once upon a time, in a land far, far away, some people involved with education, innovation, training and such things got together and invented the science of instructional development. Then they formed a profession whose members practiced that science. The science developed, revealing many new truths concerning the development and implementation of instruction. The members of that profession then lived happily ever after, having killed the mean ol' dragons of tradition, confusion, non-behavioral objectives and inadequate media selection models.

A fairy tale, or history? The present book was conceived with the thought in mind that the above paragraph represents actual history, or if not altogether history, represents history as projected into the near future. The purpose of the editors was to tell the members of the profession what the latest revelations of instructional development science are, and to describe the battles the professionals had recently fought, giving the list of newly-dead dragons.

Whether or not such a science exists, whether or not it has anything to reveal if it does exist, and whether or not there is a profession to receive these revelations are questions which each person must answer for her/himself after having read the rest of the book. The authors, through soliciting and editing chapters, have formed opinions concerning these matters, however, and these will now be presented. This is done in part so as to expose the biases of the book, and in part to serve as an advance organizer for the chapters which follow.

As for the first question, is there a science of instructional development? Or, is instructional development dependent upon some underlying science of human behavior or of learning? The authors began work upon this book believing there to be such a science, either a science of instructional development or an underlying science upon which instructional development draws for its effectiveness.*

As we neared the completion of the work, however, we had changed our views on both of these matters. First, we no longer believe there is a science of instructional development being practiced. Second, we no longer believe there to be an underlying science upon which instructional development draws for its effectiveness. We do, however, believe there to be a profession of instructional development which is being practiced by many people; this profession has a great many problems however, and if some of these problems are not resolved, that profession may not exist for long.

The reasons behind these three beliefs will now be examined in greater detail.

These reasons will be stated in terms of the concept of a paradigm. Lachman, Lachman and Butterfield (1979) explain this term as a "...common set of ideas a subgroup of scientists bring to their subject matter." More fully, they explain that

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*The term "science" has been given many meanings. Here it is to be given a meaning consistent with its use by Kuhn (1970) and by Lachman, Lachman and Butterfield (1979). Specifically, for our purposes, a science is that set of processes and products which is the intellectual propety of a community of professionals practicing research within a shared paradigm and within a shared disciplinary matrix, as these terms are used by Kuhn (1970).

> The commitment to use the scientific method in studying the higher mental processes obviously sets limits on one's scholarly investigations. However, a multitude of further decisions must be made, implicitly or explicitly, before the decision can be made as to what ideas are relevant in creating hypotheses about the nature of mental processes; what hypotheses are plausible and worthy of study; what should be studied first and what should be deferred until later. Scientific psychologists can legitimately differ in the ways they resolve these questions. However, within scientific disciplines, there is a tendency to form subgroups whose members adopt very similar resolutions. When a sufficiently large number of scientists in a field agree to a considerable extent on how such questions are to be resolved, they are said to share a paradigm.

First, it is reasonable to assume that if a science of instructional development existed, all major writers on instructional development would be working within a single paradigm. "A paradigm is what the members of a scientific community share, and conversely, a scientific community consists of men who share a paradigm." (Kuhn, 1970, p. 76)

Second, such a paradigm would spawn research designed to explore that paradigm. "We must recognize how very limited in both scope and precision a paradigm can be at the time of its first appearance...the success of a paradigm...is at the start largely a promise of success discoverable in selected and still incomplete examples. Normal science consists in the actualization of that promise, an actualization achieved by extending the knowledge of those facts that the paradigm displays as particularly revealing, by increasing the extent of the match between those facts and the paradigm's predictions, and by further articulation of the paradigm itself." (Kuhn, 1970, p. 23-24).

Third, graduate instruction would be designed to induct graduate students into the maintstream of activity and conceptual structure associated with the paradigm. "Scientists, it should already be clear, never learn concepts, laws, and theories in the abstract and by themselves. Instead, these intellectual tools are from the start encountered in a historically and pedagogically prior unit that displays them with and through their applications to some concrete range of natural phenomena; without them it would not be even a candidate for acceptance. After it has been accepted, those same applications or others accompany the theory into the textbooks from which the future practitioner will learn his trade. They are not there merely to embroidery or even as documentation. On the contrary, the process of learning a theory depends upon the study of applications...that process of learning...by doing continues throughout the process of professional initiation. As the student proceeds from his freshman course to and through his doctoral dissertation, the problems assigned to him become more complex and less completely precedented. But they continue to be closely modeled..." (Kuhn, 1970) on the paradigm governing his field.

But clearly, there is no such paradigm. Evidence for this comes from three sources, the three sources mentioned in the above asumptions. First, the leaders in the technical development of the field are clearly operating within conceptual frameworks which will not fit within a single paradigm. One merely has to read the chapters of this book on student selection, by Merrill, and those on military ISD models, by Platt, Andrews and Goldman, to realize that they are operating within different paradigms. Other examples would be provided by comparing the work on cognitive style mapping, by Bass and Hand (1978), the work of Holland (1976) in applying the experimental analysis of behavior to instructional development, the writings of Gilbert, such as Human Competence (1978), and the chapter in this book by Stahl, to see that no two of these writers are operating within the same paradigm.

Second, research models presented implicitly both within the present volume and elsewhere show that a great deal of eclecticism is practiced. When considering method, for example, we find not the single generic method of research commonly found in a single paradigm, but a whole range of methods. Naturalistic inquiry, classical research design, experimental analysis of behavior, multiple regression, factor analysis, single-case methods, formative evaluation, summative evaluation, and economic analysis are all research methods practiced and advocated by large numbers of writers in instructional development. But a paradigm is characterized by a single method or by a small set of methods all built around a common concept. Thus, again, no single paradigm can be found, and so no science exists.

Third, graduate students are trained to follow the methods and to accept the concepts taught by their professors. As can be seen from the above, the professors differ. Therefore one would expect their graduate students to differ. This is in fact what one finds. Clearly there are differences in course structure and program emphases among graduate programs in any field, but there are also major differences among instructional development programs in terms of what the core subject is taken to be; this situation is found only in fields without a single paradigm. We have all heard many times how, when a graduate of one program hires a graduate of another program, she/he feels the necessity to re-train the new employee before she/he is of any use. This seems to be true whether a graduate of Michigan State hires a graduate of Florida State, for example, or whether a graduate of Florida State hires a graduate of

Michigan State. And both would find it difficult to work with a graduate of a Mager course having twenty or so years of practical experience in the military. This is a prime sympton of the use of different paradigms in the different schools.

But if the paradigms used in training graduate students differ from institution to institution; if the leaders of the field differ according to what research methodologies they use; and if the basic literature of the field cannot be subsumed under a single conceptual set; if these conditions for the existence of a science cannot be met, then we must conclude that there exists no such science. There is, in short, no single science of instructional development.

"Men whose research is based on shared paradigms are committed to the same rules and standards for scientific practice. That commitment and the apparent consensus it produces are prerequisites for normal science... except with the advantage of hindsight, it is hard to find another criterion that so clearly proclaims a field a science." (Kuhn, 1970)

Could it be that all of these various conceptual approaches draw upon a single underlying science for their basic structures and their vitality? Such a situation is theoretically possible. It would require that each of the major threads of development above draw upon and elaborate distinct segments of that underlying science, they would have to qualify and delimit each other in such a way as to allow them to function consistently with each other, forming a single structural whole. Second, when considered alone, they each would have to be capable of developing consistently along lines which are inconsistent with each other. While not impossible, such a structure is highly unlikely to exist.

On a less theoretical level, some of the approaches mentioned earlier draw upon psychology, some upon systems theory, some upon the hueristics of development, some upon statistical theory and some upon anthropology, while others are non-statistical in nature. Experimental behavior analysts, cognitive processing psychologists and anthropologists usually consider that they are practicing different sciences. These different approaches certainly appear to be different paradigms competing with each other for followers and for application to the same problems. They do not seem to be different aspects of the same paradigm. Thus it seems clear to the authors that no single science underlies all of the work in instructional development, either when considered as a research area or as an area of professional practice. There may be a sense, however, in which it can be said that there are **sciences** underlying instructional development. For clearly there are sciences upon which we draw for factual information concerning human behavior, message design and other sets of facts with which we work. We also draw upon these sciences for methods of research and of design. But except in the sense that we borrow from them, these sciences are in no way the source of the vitality of instructional development. There is no science in existence which functions as a single, unitary foundation for instructional development, upon which instructional development has depended for its vitality in the past and upon which it can expand in the future.

Nevertheless, instructional development clearly exists, in the sense that people who call themselves instructional developers practive a set of behaviors collectively called instructional development. What, if not a science, are these people practicing? The editors are not certain. The situation is confusing. Instructional development, as practiced, appears to be different things when viewed within different environments. Sometimes it appears to be an art form. Other times it appears to be a technology, completely devoid of creativity and relatively sterile, but yet successful at producing what it was designed to produce (whether or not that is what is needed). Occasionally it appears to be what we all claim it to be--a true profession. Seldom does instructional development appear to have all of the characteristics required by an occupation to be considered to a true profession, as the sociologists define this term. However, it often appears to have some subset (often a small subset) of these. Is this adequate to permit instructional development to qualify as a true profession? Probably not.

Most of the time, when viewed in practice, instructional development appears to simply be a business, no more and no less. As such, it occupies an important but fairly limited niche in the training and education industry, and given favorable conditions, it will maintain that position for some time to come.

Many will see the above statement as negative, as attacks upon and criticisms of, instructional development and instructional developers, but they are not intended to be. It is not a criticism of a Robin to recognize that he is not an Eagle, even though it may seem so to those who previously believed and desired him to be an Eagle. But these conclusions do leave us with a question--what sort of a business is instructional development?

Again judging only through our own perspectives, the editors see instructional development as a part of the training-and-employee development industry, and also as a small part of the higher education industry. It is not the most-commonly practiced segment of that industry; stand-up lecture and multi-image media production (film, television and sound-slides, for example) and those following the humanistic tradition in training seems to comprise a larger segment of that business than do instructional developers.

Is the profession/business a healthy one? That is, is it expanding in terms of its influence over the conduct of training? Is it becoming recognized by management as indispensable to the conduct of commerce and industry? of military affairs? of government? of education? The answers appears to be yes and no, but largely no.

Several reasons exist which can be used to explain why instructional development has not yet become all that we might wish it would (and that we might wishfully believe it already has or inevitably will). First, we have yet to produce and widely distribute to the public conclusive evidence that instructional development produces significant improvements over whatever else is available. And significance has to be expressed in terms meaningful to the audience, not just to ourselves. Second, the distinction between instructional developers and other trainers is blurred in the minds of most people in management positions, whether in industry or universities. This is basically because the distinction is often blurred within our own organizations. Third, we are not yet a profession, in terms commonly used to distinguish professions from non-professions. We do not yet have certification, we are even further from professional licensing. And until we show that certified developers are superior to uncertified developers (as a minimum) we won't have licensing.

We are, in short, a business involved with behavioral change, we take an approach somewhat akin both to engineering and to advertising, we are in competition with other types of behavioral change approaches, and we have not managed to appear to many of our potential customers as better than, or even significantly different from our competitors.

We are not, in fact, always different from our competitors in terms of the improvement in training we produce. We are capable, theoretically, of producing great improvement over traditional methods. But for many reasons this improvement is often not realized in practice. For one thing, much of the knowledge which has accumulated concerning human behavior is often ignored. Second, many practicing instructional developers do not really believe in instructional development, and so do not use it. What they use instead is traditional design methods camoflauged to look on the surface like instructional development. Third, since one of the factors to consider in instructional development is customer acceptance and cost, and since a fixed budget is often fixed by a management unaware of or unable to take advantage of the potential of the complete instructional development process, the total process is often shortcutted and the full range of alternatives at each decision-point are not considered. Thus, while the product may be produced within the time, budget and political constraints prevailing, the product is little better than that which traditional training methods would have produced. In fact, it is often very little different from those traditionally used, but cost more to produce. Management will not fail to notice this, but will very likely fail to notice that this was the result, not of instructional development, but of management own limiting decisions.

The future of instructional development as a profession and as a successful business depends to a large measure upon changing the above situation. Whether or not it will change we leave to you to decide for yourself, but it is a fact that many people connected with the field hold bleak hopes for such change. We have been told by practitioners that instructional development is here to stay. But we have also been told by publishers that instructional development has died and merely awaits burial. There is another, and equally valid, view of current practices in instructional development. Many instructional development shops could be identified which produce excellently developed products. These shops exist within each of the sectors identified above. These shops produce, consistently, products which are much better than traditional practice would have produced. Thus there are, in effect, two separate states-of-the-art of those who have adopted instructional development terminology and surface features, but who do not in fact produce instructional well-developed products. These shops constitute a majority of the profession, it appears to the authors. A large minority, however, have adopted instructional development as a process and have incorporated it into their Deep-Structure. These shops do produce well-developed instruction. An analogy distinguishing and describing these two groups might be made by considering language learning. Someone who has only learned the surface features of a language cannot communicate well in that language, while someone who has learned the Deep-Structure of the language can. The problem with the profession, within this analogy, could be described by considering the problem of a non-speaker of that language (the customer) would have in distinguishing between the two. He may not be able to do so. If they both wrote letters in this language for the customer, one's letter might read well, and the other's might not, but the customer might not be able to tell the difference. If he somehow found that one such letter was bad, he might fire both people for incompetence and instructional development may not ever become a full profession, because too many poorly-developed products are being sold as instructionally developed.

These are the authors' views of the current state-of-the-art of instructional development on two levels of competence. Many readers may disagree with our conclusion, and argue that the present condition of instructional development is healthy and that instructional development is well-accepted and usually produces good products.

Which is right? Probably both, depending upon where you are looking and where you are looking from. We leave it to the readers to gather and analyze more extensive data to either support or refute these views. But a third level of competence exists within the field, and the following chapters were selected to demonstrate the state-of-the-art on this level of competence at various points throughout the field.

The chapters which follow are an attempt to explore the frontiers of instructional development, by examining selected topics in depth. These chapters do not, when taken in total, cover the entire field of instructional development. Each of the existing and projected volumes of the series, when taken together, it is hoped it will provide such coverage.** But no single volume can do so.

The authors for the various chapters were selected by polling a sample of the field to determine who were viewed as leaders in the development of instructional development. The literature was also searched to supplement the results of this pole. These authors were then contacted and asked to prepare chapters upon the areas of research, development and practice with which they were most familiar or considered most important.

The editors then confined themselves to matters of editorial support--grammar, English usage, standardizing references and other formatting features, etc. Contents were entirely the responsibility of the chapter authors. Thus, again, the editors have left it to the reader to assess the validity of the picture presented herein of the state-of-the-art of this third level of instructional development. The editors' view of this level is presented in the Summary chapter, but it in no way impacted the contents of the rest of the book.

The editors realize that not all aspects of current best thinking and practice have been included. In particular, three kinds of omissions have occurred.

Type I omissions resulted from the ignorance of the editors. There undoubtedly topics which should have been included but which were not, because the editors either were unaware of the topics or didn't know anyone both capable of and willing to prepare chapters outlining the latest development in these topics.

Type II omissions involve those topics for which the authors wanted to include chapters, but in which no new developments have occurred or which have not yet been incorporated into instructional development theory and practice.

Type III omissions include all those topics which, though included in many books on instructional development, the editors do not view as being properly a part of instructional development. Many topics dealing with the uses of computers, satellites, distant education, and the other new technologies, for example, are topics the practicing instructional development person may not need to understand, depending upon what types of systems within which his designs are used. But they are not, according to the editors, a part of instructional development. Just as, for example, word processing and counseling are not a part of instructional development, even though individual instructional development professionals might need to use them, depending upon the work environment within which she/he practices.

It remains only to explain the layout of the book before the reader is turned loose to devour its contents. The chapters are clustered into sections, not to the exact topic of the chapter, but according to the function in the instructional development process that topic concerns. For instance, Section II deals with **Strategy,** subdivided under the headings of **Metatheory** and **Strategies.** These chapters deal with the generalship of instruction development.

Chapters in Section III are grouped under the heading of **Tactics,** and these chapters deal with the methods involved in implementing the grand theories discussed in the previous section.

The fourth section is titled **Logistics.** This section deals with matters such as evaluation, staffing and cost-effectiveness, which are not a part of the grand strategies nor of the tactics which implement them, but which serve in a supportive role and without which the grand strategies probably would fail.

Section V is titled **Diffusion.** This section addresses the question, how do the grand strategies, tactics and their supportive elements interface with the rest of society, and how do we get people to implement these strategies?

Applications of instructional development in various settings, such as the military, the international sector, and industry, are explored in Section VI.

Personnel are dealt with in Section VII. Such areas as the training and certification of instructional developers, and the status of women in the profession, are explored here.

Section VIII deals with **Futures** of instructional development, and finally comes Section IX, the **Summary.**

The source of the plan for organizing the chapters of the book is probably obvious by now. It is a plan similar to one which might be found in a textbook on military affairs. Perhaps the similarity in organizational plans can serve as an analogy to show the similarities between the two professions of military science and instructional development. Neither are true sciences. Both have specific areas of human behavior with which they deal. But both obtain most of their content from other sciences. Further, both are aimed at practical achievement, not at the accumulation of knowledge. Knowledge is valued by both professions only to the extent that it proves useful in achieving important goals. Further, the success of the practitioners of both professions derive much more from the plans of attack, the faithfulness of execution of these plans, and the insightfulness and creativeness of the individuals executing them, than from the knowledge of human behavior, elec-

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**The present volume is the second volume in a series. The first volume, published in 1978, covered topics not included in the present volume. Both volumes taken together are necessary to obtain maximum coverage of the field; they are complementary volumes. Future volumes in the series will extend this coverage, as well as update topics whose coverage in the present two volumes has become dated.

tronic devices and theoretical superstructures composing the trappings of these sciences.

What follows partakes of the most advanced aspects of these trappings. However, the editors are sure the readers will find much of the abovementioned insightfulness, creativeness, and faithfulness to well thought-out plans in the chapters which follow.

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II. STRATEGIES

Strategies are those aspects of an activity or process which have high generality and wide applicability throughout that domain within which the process or activity occurs. As used here, it refers to aspects of the practice of instructional development which are useful in conjunction with many different specific ID techniques or approaches.

This section has been divided into two sub-sections, "Meta-Theory" and "Strategies." The first of these deals with the theoretical bases of ID. There are five chapters in this sub-section, each of which presents a unique theoretical approach to the foundations of ID.

The first of these chapters analyses ID in terms of concepts derived from contemporary philosophy of science. The second chapter does the same, but from the General Systems Theory. The third chapter examines the relationship between ID and other elements of our social system. the fourth Chapter considers the social implications of technical interventions in social situations. The fifth chapter presents a generalized version of the analysis-synthesis process, applicable to almost any problem.

The second sub-section, called "Strategies," deals with over-all plans for attacking a wide variety of problems. These plans are more specific than the discussions in the preceeding chapters, but are still of a general nature capable of a wide range of application. This sub-section contains four chapters.

The first chapter discusses strategies for maintaining both the cost-effectiveness and the appearance of cost-effectiveness of an institutional service center.

The second chapter analyzes currently-available ID models, and discusses the process for creating customized models. The third chapter concerns the analysis of interfaces, those locations within systems at which sub-systems interact. The final chapter of the sub-section explains the design and use of certain generic classes of games, useful in a wide range of instructional designs and methods.

The chapters of these two sub-sections provide the basis for the activities, analyses and precesses discussed in the remainder of the book. Once the strategy is established, tactics and logistics can be determined, based upon the needs of the strategy selected.

Clearly, we are advocating a theory-based approach to ID through our use of this organizational structure in the book. Also, we are arguing that, though ID is very eclectic in both theory and practice, there exists a theoretical basis upon which ID stands, one which is peculiarly and exclusively the property of ID.

A. Meta-Theory

2. Instructional Development: Themata, Archetypes, Paradigms, and Models. Ivor Davies.
3. Educational Interpretations of General Systems Theory. William E. Hug and James M. King.
4. A Place in Space: I.D.'s Universe. Robert S. Braden.
5. Instructional Development: The Social Implications of Technical Intervention. Thomas M. Schwenn, David F. Leitzman, Earl R. Misanchuk, Wellesley R. Foshay, Kenneth M. Heitland.
6. METAMETHODOLODY. Thomas E. Hutchinson.

B. Practical Approaches

7. A Matter of Survival: Instructional Development and Austerity. Robert M. Diamond.
8. State of ID Systems Approach Models. Madeline J. Trimby and Castelle G. Gentry.
9. Interface Analysis of Instructional Development Systems. Castelle G. Gentry and Madeline J. Trimby.

A. METATHEORY

Chapter 2

Instructional Development: Themata, Archetypes, Paradigms and Models

Ivor Davies

What is the nature of instructional development? Is it a science, an art, or a combination? Is its structure that of other fields, or is this structure unique? What are the distinguishing characteristics of ID? If we are to "do" ID, perhaps we should know what it is. If so, the present article should be of great value.

> "Lord Ronald...flung himself upon his horse and rode off madly in all directions."
>
> Stephen Leacock:
> Gertrude the Governess

Like Lord Ronald, instructional developers have tended to run off madly in all directions. The range and seriousness of the problems facing education and training, coupled with the promise provided by instructional development, has tempted developers. In an effort to be useful, instructional developers have evolved a wealth of techniques without providing a corresponding richness in their underlying theory.

The nature of instructional development is a matter of concern. At various times, developers, or groups of developers, have conceived of the endeavor in different terms. Some see it as an art, others as a craft, and still others as a science (see Coscarelli, 1981). The notion of a technology still runs deeply, and may well lie at the heart of the matter. Indeed, many of the so-called models of instructional development address the notion of technology more than they define the nature of the activity itself.

TECHNOLOGY AND METHODOLOGY

The word "technology" means different things to different people. Far from assisting in the dissemination of instructional development, use of the word "technology" has sometimes become something of a barrier to its acceptance and understanding. For many people, the term implies machines of one type or another. It suggests an orientation that seeks to de-humanize education and training, relegating people to a subservient role. Teaching machines of the 1960s, and now computer terminals in the 1980s, have seemed for some to be the solution to all educational problems.

The association of machines with the word "technology," however, is of relatively recent origin. It is an association that began with the Great Exhibition, the showcase of the Industrial Revolution, in the Crystal Palace in 1851. The older and richer meaning, though, is concerned with know-how, the fruits of knowledge combined with experience. In such usage, instructional development takes on a humane and significant connotation. Variety is expected, for human experience and knowledge are boundless. Know-how fuels the skills of technology, but methodology supplies the bond.

The range for action in instructional development, viewed as a technology, is vast. Problems abound, and opportunities are limitless. Nevertheless, developers tend to work along more or less parallel paths when they seek to design, produce and evaluate instructional environments in order to meet specific instructional needs. Methodology, in other words, constitutes a common factor among instructional developers at large.

Although developers may well describe their field differently, and although their training, background and experiences may be varied, their common methodology gives the field integrity. Needs analysis, identification of objectives, task analysis and learner analysis are all parts of the methodology of instructional development. But they do not define the field, any more than sawing, planing, chiseling, shaping, hammering and finishing define the field of carpentry. The nature and scope of instructional development remains hidden when only techniques are discussed.

Progress will only take place if the field, as a whole, is discussed and debated. As with so many things, the whole is so much greater than the sum of the parts. The nature of instructional development is a research problem, as is the nature of geography (see Hartshorne, 1951) or the nature of literary criticism (see Frye, 1957). It is important to examine a field as scholars have worked within it and conceived of it. Only then will it be possible to answer such questions as:

- What is instructional development, and what are its characteristics?
- Does instructional development have integrity, and what is its logical position among the different fields of human endeavor?
- What are the major problems of instructional development, and how may the activities of developers be made more significant?

Such questioning portrays the emergence of instructional development as a mature field.

INSTRUCTIONAL DEVELOPMENT AS EFFICIENCY AND EFFECTIVENESS

Two threads run through the literature of instructional development. One involves efficiency, and the other effectiveness. In a very real sense, they have become the two goals to which developers strive, and by which their results are measured. Yet the two terms are often used without a full appreciation of what the words mean, or what is implied by the distinction between them.

Indeed, efficiency has become something of a cult among instructional developers, partly due, perhaps, to the many fiscal problems facing educational and training agencies worldwide. Such a value has further reinforced an emphasis on systematic* methods of development, and nurtured a tendency to freeze methodologies and techniques in a fixed form. The "one best way" approach has often reduced creative ideas to cookbook-like recipes, and promising heuristics to algorithms.

There has been a great deal of discussion, for instance, on the best way of writing objectives, and too little on alternative ways of mapping them (see Davies, 1967). There has been some debate on how media should be selected, but little on alternative ways of integrating media (projected and non-projected) into course content and learner experiences. As a result of this type of myopia, alternative ways of proceeding have been overlooked, and creative ways of proceeding have been short-changed.

Peter Drucker (1967) put the matter rather well when he wrote:

> "Intelligence, imagination and knowledge are essential resources, but only effectiveness converts them into results. By themselves, they only set limits to what can be attained."

Effectiveness is the ultimate goal of instructional development, but creativity, too, has an essential role. Art and craft provide the life-forces which animate the technology.

Role of Efficiency

Efficiency is concerned with doing things right, with doing things correctly. See Figure 2-1. Efficiency is important, and its presence is usually obvious. Most of us can recognize efficient development, just as we can recognize efficient teachers and instructors. Certain things have to be attended to, both in development and in instructional situations. The learning task, for instance, should be relevant and worthwhile. Objectives should be clearly communicated and expectations understood. Materials should be well written and well designed. So it goes on.

The important thing is that efficiency implies a sense of direction and good organization. Instructional development must be concerned with efficiency, and developers should be commended for their contributions to it. However, efficiency does not imply effectiveness, as will be made clear below.

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*The words "systematic" and "systemic" come from different roots. The former from the Latin, with a nuance of order or interval; and the latter from the Greek, with a nuance of organized whole. In instructional development the term system is often used to characterize an approach, when systematic is implied. (See Davies, 1981b).

The important thing is that efficiency implies a sense of direction and good organization. Instructional development must be concerned with efficiency, and developers should be commended for their contributions to it. However, efficiency does not imply effectiveness, as will be made clear below.

The name of the game

Efficiency	**Effectiveness**
is doing	**is doing**
the right things	**things right**

doing the right things right

Figure 2-1. Efficiency and effectiveness in instructional development.

The Role of Effectiveness

Effectiveness is concerned with doing the right things, with the things that need to be done. It is a function of what developers do. It is a measure of the extent to which they realize their several responsibilities. If developers fail to manage development properly, so that learners fail to achieve required levels of mastery, then instructional development has been ineffective--no matter how efficient it might be.

Effectiveness is judged by what is accomplished. Although efficiency may contribute to effectiveness, it does not guarantee it. Effectiveness, though, is what instructional development is really about. It involves taking account of both the needs of the task and the needs of the learners involved. Both sets of needs, people and task, have to be met and harmonized. Sometimes one set of needs are more important than the other. Usually, however, both are important and both must be taken into account. Effectiveness is the central issue of instructional development (Davies, 1972; 1973), as well as the ultimate goal of its methodology.

Skills of Effectiveness

In order to be effective, developers must make effective decisions. Learning needs must be identified, resources arranged, methods chosen, motivation harnessed, progress monitored, and plans for improvement implemented. These are time-consuming tasks for developers to undertake. Yet they are essential ones, if effectiveness is to be obtained.

Four prime skills are involved with effective development. Developers who seek effectiveness need to be:

- Sensitive

  This means sensitive to the needs of the task and sensitive to the needs of the learners who must accomplish that task.

- Diagnosticians

  This means being able to determine what is required, and what needs to be done if mastery is to be achieved.

- Decision-makers

  This means choosing optimal designs for learning and then putting them into effect without passing up unplanned opportunities.

- Flexible

  This means implementing what the learning situation requires, and varying development plans accordingly.

All of this, of course, requires dedication and skill. Above all it involves a clear understanding of where time goes. Effort must be geared to results. Effectiveness also requires that development build upon people's strengths, not upon their weaknesses.

Making Effective Decisions

Effectiveness also involves making the right decisions. Sometimes decisions are easy, sometimes they are routine. At other times, ID decisions are demanding, and require a great deal of thought and exploration of creative alternatives. There is no best way in development, and there is rarely any best decision.

A decision is a choice between a number of competing alternatives. Rarely is it a choice between what is right and what is wrong. More usually, in instructional development, it is a choice between a number of options, all of which have advantages and disadvantages for the situation in hand. As Peter Drucker (1967) suggests, a decision is:

> "...at best a choice between 'almost right' and 'almost wrong'--but much more often a choice between two courses of action neither of which is probably more nearly right than the other."

For this reason alone, instructional development requires a great deal of sensitivity and flexibility, as well as analytical activity of a high order. A decision in one instructional situation is not necessarily a precedent for another.

The Essential Themata of Instructional Development

In a very real sense, all instructional development activity represents so many "case studies." Cases that are specific to a particular time and place, to a specific set of task and people needs. Such cases, however, are woven around two common strands of thought. Both strands need to be taken seriously by instructional developers as they reflect upon their craft. They involve, first, certain basic themes or "themata," and second, essential "archetypes" or ways of looking at things.

The term "themata" identifies certain themes that run through and across the literature of instructional development. These themata provide self-explanatory insights into the activities of developers, as well as a bridge over areas of ignorance. In effect, they are believable propositions, which are difficult to corroborate or refute (see Holton, 1973). As such, themata have a strong hold over the minds of instructional developers, showing great persistence throughout the literature.

Among the primary themata of instructional development are the recurring themes of "technology," "systematic approach," and "systems thinking." Also included are the dual themata of "efficiency and effectiveness." In many ways, such characteristic activities or technological concerns as "needs analysis," "task analysis," "learner analysis," "design and development" and "evaluation" have taken on the role of themata in the thinking of instructional developers. (Davies, 1981 d).

In the newer sciences, Holton (1973) argues, the underlying themata are more obvious. They tend to be discussed with great freedom whenever any attempt is made to define these sciences in terms of domains of human activity. Furthermore, such themata are used as a basis for decision-making. These characteristics aptly descibe what has happened in instructional development over the last two decades, although a subtle change has occurred in the last five years or so.

Although such themata still characterize thought in instructional development, they are taken much more for granted and are rarely discussed in any depth. It is as if they have blended into tradition, particularly as more and more ID decisions are made upon theoretical and empirical grounds. Holton regards such a shift as an indication of maturity. In such a stage, the idea of rejecting fundamental themata would be seen as "paradoxical, ridiculous, or outrageous." This is how any suggestion to abandon objectives or evaluation would be described in 1983!

ARCHETYPES, PARADIGMS AND MODELS IN INSTRUCTIONAL DEVELOPMENT

As in any area of disciplined inquiry, instructional developers do not theorize in a vacuum. The ways in which problems are stated, themata readied, and principles and concepts used provide a starting point for theorizing. Empirical data, assumptions and specific techniques are also used to illuminate the situation, as well as to suggest a range of appropriate strategies and tactics.

Other factors, as Phillips (1971) points out, also influence theorizing. Such factors as simplicity, robustness, elegance and sophistication are important. So is coherence with established theories in education and training, as well as in instructional development itself. In other words, instructional developers always have a theory. Sometimes it may be crude, at other times highly sophisticated. Yet theory, regardless of its character, shapes the way a situation is perceived. It also influences the values that surround it.

Two terms are often used in the general literature dealing with disciplined acts of inquiry. They are "archetype" and "paradigm." Since the term "model" is often used in the literature of instructional development, usually with little or no real precision, it is also important to consider what is being suggested when that term is used.

An Archetype

The general viewpoint or perspective used by someone engaged in an act of inquiry is technically referred to as an "archetype" or "root metaphor." It acts as a loose theoretical framework or prototype; a primordial image or pattern, as it were, which constantly recurs in professional thinking. Archetypes are usually internally consistent enough to be considered as universal principles or heuristics for thought and action.

The term was first used in English around the year 1605. It is part of the vocabulary of historians, anthropologists and psychologists. Jung (1922), for instance, used the term in the context of a "primordial image," a "psyche residue," which constantly repeats itself throughout human experience. Unlike themata, however, which are free of a particular theoretical position, archetypes serve to bind together loose classes of assumptions into the nucleus of a theory.

Frazer (1871), in The Golden Bough, uses the term to trace particular elemental patterns of myth and ritual which recur in the legends and ceremonials of diverse cultures. The term has also been used by Robert Graves, Wilson Knight and Northrop Frye in the context of literary criticism. They use it to identify narrative designs, character types and certain images which appear over a wide range of writings.

The term "archetype" is also meaningful in the context of instructional development. It usefully identifies myths, dreams and ritualized modes of professioinal conduct which--rather than be seen for what they are--have often been taken for what they are not. They hold recognizable professional groups together, as well as anchor informal networks and clusters of instructional developers. Archetypes offer developers a basic set of assumptions, a language of belief, and a set of valued activities. Usually they are captured by slogans, such as "Help stamp out non-behavioral objectives," or metaphors, such as relating development to a craft.

A Paradigm

An archetype can give rise to a number of different paradigms. Usually, though, only one paradigm is involved, although it may be presented in varying degrees of detail or complexity. In essence, a paradigm is a more concrete conceptualization of an underlying idea or theory. It involves definitions, statements and interrelationships. The archetype has been refined, so that a coherent tradition of research and practice is possible.

Paradigms are usually qualitative in nature. They may be expressed in words, in numbers, or in a visual display. In instructional development, a diagram illustrating important relationships by means of boxes and arrows is often used. In this way, a unique description of ID is portrayed. Underlying methodologies are indicated and research questions worthy of further study are suggested. Paradigms are often used to help account for events previously difficult to explain.

Unlike an archetype, a paradigm rarely represents a dramatically new orientation. Nor does it attempt to offer a "world-view" or wide, embracing perspective. It is much too limited and applied for that to occur. However, as in instructional development, a particular paradigm can be recognized in two important ways:

- The paradigm is sufficiently novel and appealing to attract an enduring group of adherents away from competing schools of thought or action. The engineering paradigm in instructional development, for instance, has attracted many people who would formerly have described themselves as media-oriented.

- The paradigm is sufficiently open-ended to allow adherents to pursue all sorts of problems in a manner that allows them to refine and define further the details of the basic paradigm for themselves. This is characteristic of what is currently happening in instructional development. Such recruitment is giving new life and vigor to ID.

It can safely be assumed that when a small group of developers work together, their shared values and concerns indicate a shared paradigm of one kind or another. Such a paradigm acts as a cohesive binding for their work (see Mullins, 1973).

Once a paradigm or series of paradigms have been proposed, details and ambiguities must still be identified and resolved. These will commonly result in different variations of the same paradigm. The basic principles remain, but the emphases, priorities and particulars change. Indeed, the number of variations can be endless. New paradigms, in fact, can be mistakenly proposed, when nothing more than a variation is involved. Indeed, the paradigms currently espoused in instructional development are worryingly limited, although the variations are many.

A Model

The literature of instructional development seems especially rich in models. However, in the context of the preceding discussion, many of them are technically paradigms. A model usually has a quantitative dimension. It is a much more specific and detailed representation of reality.

A child's model car, for instance, usually bears a quantitative relationship to the real thing. The distance between the rear wheels on the model can be used to calculate the distance between the wheels on the original. In a similar way, a model in science bears a quantitative relationship to reality. A map is a model, for distances on the map represent distances on the ground. Similarly, a mathematical equation is a model, as is a photograph. Simulators are models, too.

The idea of modeling is hardly new. Early astronomers constructed models of the universe as they conceived of it. Engineers made models of the bridges and aqueducts which they designed. Architects, too, have long made models of the towns they have planned and the buildings they have designed. What is new is the recognition that is currently being given to model-building as a creative act of inquiry. The extent to which models are currently employed as a basis for intellectual activity is also relatively novel.

Three main reasons have been suggested for the growth of model building in research and development, as well as their ready acceptance (Starr, 1971). First, the deliberate manipulation of people and organizations in research is questionable, and in some cases unlawful. Second, the amount of uncertainty with which professional people have to deal has been increasing rapidly. Mistakes are more likely, while the costs (human and financial) associated with them are increasing at an alarming rate. Finally, as a result of developments in operations research, our ability to build models which are good representations of reality has improved to such an extent that there has been increased interest in them and increased confidence in their usefulness.

The ultimate destiny of a paradigm, from a theoretical viewpoint, is falsification. Only by falsifying it can it be replaced with a more accurate and useful portrayal. On the other hand, the ultimate destiny of a model is verification. Only by demonstrating that it represents reality can its use be justified in the solution of a specific problem.

Models, of course, are specific to particular phenomena. Quite different models, however, may represent an identical set of phenomena examined from quite different paradigmatic points of view. It is quite possible, for instance, to model stress in terms of a person's response to disturbing or noxious instructional environments. Stress can also be modeled in terms of the stimulus characteristics of such environments. Finally, stress can be modeled as a lack of 'fit' between a person and the environment. The important property of a paradigm lies in its suggestive power. The importance of a model, on the other hand, lies in the manner in which it is possible to formulate associated hypotheses that can be tested.

Three criteria can be identified for a model (Keeble, 1967). A model should:

- Single out crucial variables.
- Define concepts precisely enough to permit comparison with the real world.
- Possess an analytical rather than a descriptive framework.

In instructional development, few models meet these minimal criteria. Most are purely descriptive; few of the concepts permit comparison; and fewer still single out significant variables for inclusion in a testable hypothesis.

In instructional development, few models--with the possible exception of Aptitude-Treatment-Interactions (ATIs) and certain motivational theories--have been rigorously tested. Indeed many empirical investigations seem to take place, without reference to underlying theory. Instead, the field tends to be overly characterized by many small pieces of self-contained research. Such studies are difficult to synthesize within a coherent framework which would be useful as a guide to future action. Fortunately, several attempts have been made at supplying a coherent framework during the last few years (Hartley & Davies, 1976 & 1978; see also Ladas, 1980), but many more are still needed.

OBJECTIVE AND SUBJECTIVE PARADIGMS IN INSTRUCTIONAL DEVELOPMENT

For many, the concept of instructional development implies a systematic approach to learning "in which one tries to develop means to achieve given ends and persists in one's attempts to find solutions to problems" (MacKenzie, Eraut & Jones, 1976). The most common archetype is the engineering one, and the associated paradigms are heavily biased towards the kinds of objectivity which have traditionally been valued in science as it is normally perceived (see Kuhn, 1970). This has led to a suspicion among many developers that the notion of objectivity is the only paradigm possible in instructional development. It is as if perception, consensually validated, is the only professionally acceptable way of knowing and understanding reality.

Yet an alternative is available. It is a particularly rich one for instructional development. It involves the notion that there is also a subjective paradigm (Bleich, 1978), and that both objectivity and subjectivity are assumptions to be tested. The very process of observation, in educational or training contexts, interferes with what is being observed. As in any situation, the phenomena observed are changed by the very act of observation.

Eddington (see Heisenberg, 1958) put the matter dramatically when he wrote:

> "We have found that where science has progressed the farthest, the mind has but regained from nature that which the mind put into nature. We have found a strange footprint on the shores of the unknown. We have devised profound theories, one after another, to account for its origin. At last, we have succeeded in reconstructing the creature that made the footprint. And lo! It is our own."

There is, indeed, a limit to objectivity, and that knowledge leads back to the developers who are actively engaged in acts of inquiry. Problems are solved by people. However, the data which they collect is contaminated by the developers making the observations, analyses and evaluations.

A great deal of the current concern in ID with morality and ethical matters can be viewed as a direct contribution from the subjective paradigm. Poole (1972), for instance, argues that since "the body is the locus of all ethical experience, all experience is, because spatial, ethical. There can be no act which does not take place in ethical space. There can be no 'flaccid' act, no act devoid of all significance, no un-conditioned act." Knowledge and responsibility, in other words, are both aspects of the subjective paradigm; the one permeates the other.

Ethical concerns have little or no role in the world of the objective paradigm. Such a thought is of particular importance for instructional development, since the antecedents of so many of its themata and methods are clearly discernible in the principles of behaviorism. The very advantages of behaviorism, viewed from the perspective of the subjective paradigm, raise important ethical questions for ID. Dogmatism and skepticism, however, are human failings which are associated with both paradigms. At the very end, developers are still faced with the problem of making decisions based upon both quantitative and qualitative information. Appropriateness is the key issue, as is flexibility.

THREE ARCHETYPES AND THREE PARADIGMS OF INSTRUCTIONAL DEVELOPMENT

In the light of the preceding discussion, it is possible to discern three archetypes in the literature of instructional development. The first archetype is an audio-visual one. Although it was initially developed in the media field during the 1930s, it became particularly important in the years following the Second World War. To a certain extent, it is still evident in the writings of some developers to this day.

The second archetype is an engineering one. It came into prominence with the emerging interest in programmed instruction in the early 1960s. To a very large extent, it still characterizes much of the field of instructional development. The third and final archetype is a problem-solving one. It is related to the creative process, as well as to a systemic way of looking at things. This archetype is currently emerging, both in the United States and in Europe, as the focal-point of the more creative developmental activities.

Each one of these archetypes has led to the development of a series of related paradigms. Although more than one paradigm has developed for each of the "root metaphors," the differences are in detail rather than in substance. Accordingly, it is possible to indicate the major concerns and development procedures by looking at one paradigm for each of the three archetypes.

For the sake of illustration, a metaphor is used for each paradigm in order to indicate the flavor of the underlying thinking. As with all figurative language, the metaphor should not be taken literally, nor even seriously. Figure 2-2 ilustrates both the three paradigms of instructional development and their associated metaphors. In each case, additional detail could have been added to the diagrams. The aim, however, has not been to be as exhaustive as possible; instead, an attempt has been made to indicate the major thrust of each one of the three contrasting approaches.

The Audio-Visual Archetype

The Audio-Visual archetype predates the other two archetypes of instructional development. This, perhaps, explains why media departments in so many universities have associated with them, as an apparent anomaly, instructional development responsibilities. The metaphor commonly associated is one of the gum-ball machine. An investment is made, and what is obtained in return bears some relationship to what is desired. So it is with the associated paradigm, although investment does not always equate with return.

Instructional development, often in this context called educational technology, has five broad purposes. It assists in classroom presentations. Additionally, it helps improve both the efficiency and effectiveness of a wide range of demonstrations, by bringing into the classroom experiences normally unavailable to learners. The archetype also helps solve many of the problems of distance-teaching (as in the use of radio, television, films, sound cassettes, and the mail services) by enabling teachers to deal with learners located in different parts of a state or country. Instructional development is also seen as a means of enriching teaching and learning. At the same time, technology is seen as offering a novel form of instrumenting assessment and testing procedures.

The Engineering Archetype

The Engineering archetype came into being with the advent of programmed instruction. It was assisted by the application of behavioristic technology to the problems of teaching and learning, as a result of the influence of Professor B. F. Skinner in the late 1950s. Operant conditioning and the shaping of human behavior became part of a radically new technology of education and training. It also generated a good deal of emotion for and against educational technology itself.

A great deal of the initial effort which has been expended within this paradigm has involved comparing the respective performance of one method with another. Teachers, for instance, were compared with programmed texts, behaviorally-stated objectives with more generally-stated objectives, and goal-centered evaluation with goal-free evaluation. In this way, the advantages and disadvantages of each of the options were assessed in an attempt to identify the best way to go. The metaphor, in each case, is that of a slot-car race, in which one car is raced against another in order to see who wins.

The underlying paradigm in instructional development is usually captured by a flow diagram of one sort or another. More often than not, the diagram consists of a series of boxes and arrows, with a feedback loop, indicating a step-by-step approach to design, development, implementation and evaluation. Almost always, ends are defined before means. A systematic approach is belabored as the only way to go, and each step is perceived as almost being a self-contained activity. Unlike the Audio-Visual archetype, the Engineering one appears to be heavily mechanistic in its underlying orientation.

The Problem-Solving Archetype

The Problem-Solving archetype began to be adopted around 1973 or 1974. Although it is still not characteristic of the everyday activities of the majority of instructional developers, it is fast becoming an alternative way of seeing things. The associated metaphor is that of a chess game, in which players engage in a demanding intellectual activity. There is no one best set of moves, no one way of going. Intense concentration, ability to foresee the consequences of current actions, flexibility, and acquired skill and experience are all essential prerequisites to efficiency and effectiveness. So it is with instructional development.

In education and training, some sort of dissatisfaction should preface developmental activities, according to this archetype. The overall goal is to obtain some state of satisfaction in terms of human performance. The aim, as it were, is to reduce the probability of error (Davies,

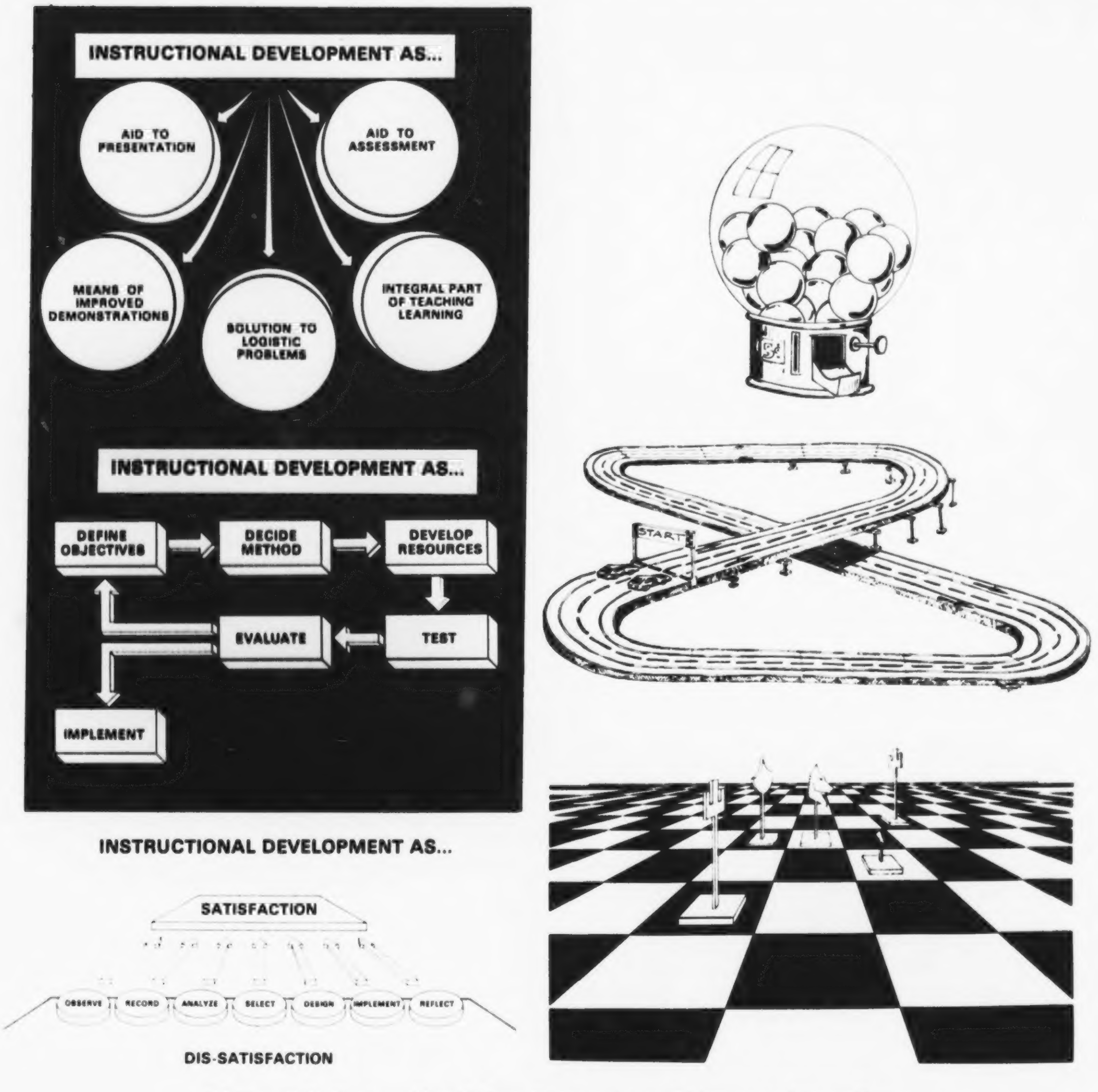
INSTRUCTIONAL DEVELOPMENT AS...
AID TO PRESENTATION
AID TO ASSESSMENT
MEANS OF IMPROVED DEMONSTRATIONS
SOLUTION TO LOGISTIC PROBLEMS
INTEGRAL PART OF TEACHING LEARNING
INSTRUCTIONAL DEVELOPMENT AS...
DEFINE OBJECTIVES
DECIDE METHOD
DEVELOP RESOURCES
TEST
EVALUATE
IMPLEMENT
START
INSTRUCTIONAL DEVELOPMENT AS...
SATISFACTION
OBSERVE
RECORD
ANALYZE
SELECT
DESIGN
IMPLEMENT
REFLECT
DIS-SATISFACTION

Figure 2-2. Instructional Development: archetypes and paradigms.

1981c). In order to accomplish this, an instructional developer brings to the situation a range of technologies. Observation, analysis, synthesis, reflection and design capture some of the skills. There are, however, many more. The order and manner in which they are used depends upon the character of the problem situation and the aim in mind. There is no one best way. Rarely is there an ideal solution, at least in the majority of cases. Everything depends upon the situation, the problem and the perceived way of tackling it, as well as upon the individual styles of the people involved.

Four Classes of Problems

Generally speaking, four broad classes of problems can be recognized in the work of instructional developers. Each class of problems is associated with a set of typical ways of tackling them. The four classes of ID problems can be identified as:

- Problems of deviation.
- Problems of improvement or renewal.
- Problems of prediction.
- Problems of acceptance.

Each requires developers to respond in rather different ways.

Problems of deviation occur when there is a gap or deviation from some known standard. The gap should be of sufficient magnitude to warrant corrective action, otherwise the effort involved in producing the correction is wasted. Examples of this type of problem occur when people's performance in language or number skills is below a desired norm. In industry, evidence of problems of deviation is seen when people are unable to perform their job at a required level of adequacy. Such deviations from what is required are usually the product of deficiency in knowledge, skill or attitude.

Problems of improvement or renewal are basically involved in situations in which there is a perceived need to bring about some change in performance. Often these arise, less from a lack of knowledge, skill or attitude, and more from not wishing to perform at the desired level. Sometimes it is a problem of motivation, sometimes of supervision. More usually, the problem arises from poor communication, or simply an absence of feedback. Poorly designed tasks or tools also share their part of the blame. Regardless of cause, tackling the problem necessitates bringing about an improvement or renewal in performance.

Problems of prediction are gradually becoming more and more frequent in the experience of instructional developers. They generally involve situations in which there is a need to anticipate emerging or future changes in society, in the economy or in technology. An example of this might be found in industry, where the development of a new process entails retraining workers to operate a plant before it is even constructed. Predicting training needs in such a situation is a demanding task. It involves carrying out a task analysis before the task exists for observation. However, the weight of the evidence is very strongly in favor of such techniques, and work in the area of problem-prediction is occurring more and more. Indeed, Indiana University has become a center for working with such problems.

Problems of acceptance are commonplace. The problems associated with dealing with planned change are everywhere. Indeed, the diffusion and adoption of new ideas and methods of doing things constantly beset education and training. Although a wide range of strategies and tactics are available to instructional developers, resistance to change and sheer inertia often present seemingly insuperable barriers. Overcoming these is no mean task, and instructional developers are intimately involved in their solution.

THE NATURE OF INSTRUCTIONAL DEVELOPMENT

Despite the themata, and despite the archetypes and paradigms available to developers, instructional development is not a concept which can be clearly defined. It is not an easy thing to pin down, or even to describe and explain. The simpler the description, the more obvious the concept becomes; the more complex the description, the more bewildering it becomes. Instructional development is not a concept like mechanics. It is more like liberty, to which, in fact, it is somewhat related.

As a concept, instructional development refers to no particular process. The activities and techniques of instructional development, as we have seen, better describe the technology available. They do not define ID itself, although they have an essential role within it. Rather the term instructional development:

> encapsulates criteria to which each one of the technologies must contribute and to which the final product must conform in some meaningful manner.

To say that instructional development is not a process, but is a set of criteria, highlights the fact that there are certain standards to maintain (see Davies, 1981b).

Although developmental projects vary, and problems change, the criteria are unchanging and demanding. They ask, both in terms of the short-term as well as the long-term, a series of questions. These include:

- Are the end results (sensitivities, values, attitudes, skills and knowledge) worthwhile? The experiences should certainly be relevant and capable of justification.

- Have the understandings, attitudes and skills essential to mastery been acquired? Knack, simple technique, and basic knowledge are insufficient to produce worthy performance.

- Have the learnings been integrated into people's lives, so that reliable performance is achieved? Learners should actively portray standards, skills and thoughts.

- Has the experience been a motivating and joyous one for everyone taking part? Learners and developers should both feel a sense of achievement and personal involvement.

Instructional development, in terms of how it is done, can be different things to different people. It can be cold, clinical and sterile; it can be warm, exciting and imaginative. It can be an art, a craft or a science; mechanistic for some, dynamic for others. Regardless of how it is carried out, however, the game is the same. Criteria are involved, and problems await solution.

CONCLUSION

Although developers define their field differently, methodology in its wide-ranging variety contributes to the integrity of the field. Running through the literature are a series of themes or themata, which have a strong hold over the minds of developers regardless of the theories to which they subscribe. Although they are still used as a basis for decision-making, greater appeal is now being made to more general theory and empirical findings. Such a change suggests that instructional development is now reaching a stage of maturity.

Cutting across the basic themata are three contrasting archetypes, each with a set of related paradigms for action. The Audio-Visual origins of the field are, at last, being placed in their historical perspective, and the engineering archetype is gradually being rejected in favor of the problem-solving metaphor. It is now generally recognized that there is "no one best way." Skepticism and dogmatism have largely had their day, and for the instructional developer, as for Kant in his Critique of Pure Reason, "the critical path is alone open." (Kant, 1781). Reflection, criticism and evaluation are the bonds which hold the technologies together. They, alone, deal with the question of appropriateness.

Instructional development is not a process. The tools and techniques of ID no more describe instructional development than the tools and techniques of the carpenter describe carpentry. The concept is not an easy one to tie down, but in essence it encapsulates a set of criteria to which the technologies must contribute, and the final product conform. Regardless of what is done, criteria is the name of the game when problems demand solution.

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Chapter 3

Educational Interpretations of General Systems Theory

William E. Hug
James E. King

Are instructional designers also systems analysts and do they practice General Systems Theory? Not according to the following chapter. It addresses the concept of equifinality, how innovations are displaced by the re-establishment of equilibrium and other points related to General Systems Theory.

The literature of General Systems Theory develops concepts that help describe physical, biological, and social systems. During the past decade the use of General Systems concepts has become fashionable even though these basic concepts frequently appear to be misunderstood. This is especially true in instructional and curriculum design and in instructional materials development.

INSTRUCTIONAL DESIGN, SYSTEMS ANALYSIS, AND GENERAL SYSTEMS THEORY

The most common conception of the application of General Systems Theory in educational reform is that application associated with performance and competency-based educational programs. In the minds of many, a program which has been derived from explicit objectives which are tested by criterion-referenced tests is an application of General Systems Theory and systems analysis. Actually, there is frequently little visible evidence as to the extent that instructional design models like those of Gagne and Briggs (1979) and systems analysis as conceived by Daniels and Yeates (1971) relate to the basic concepts of General Systems Theory. In fact, neither Systems Analysis (Daniels and Yeates, 1971) nor Principles of Instructional Design (Gagne and Briggs, 1979) indexes the term "General Systems Theory." Nevertheless, curriculum workers, educational technologists and others frequently justify their approach to program design in terms of General Systems Theory, when the assumptions and procedures used actually better fit the rubrics associated with instructional design and systems analysis.

Banathy enumerates the implications of a General Systems view of education (1976):

- the simultaneous consideration of the four levels at which education systems operate--the societal, institutional, instructional, and learning experience level--as well as the understanding of the interdependence and dynamic interaction of those levels.
- the definition of the key entity around which each of the systems is organized (at those four levels) and the designation of the primary systems level in the systems hierarcy.
- the interactive consideration of (1) the context or environment in which the education systems exist, (2) the outcomes or

products that are to be produced by each of the four systems, (3) the functions that are to be carried out to bring forth the outcomes, (4) the structure of systems components, and (5) the processes applied in the operation of the system.

The differences between instructional design or systems analysis and General Systems Theory can best be seen by understanding the purpose for which each exists. Instructional design is a systematic set of procedures for generating, implementing, and evaluating educational programs. Numerous industrial operations use systems analysis in a similar way and for like purposes. General Systems Theory, on the other hand, emphasizes the study of a whole entity by understanding the functional relationships existing among the components of all systems. The task of this general science of "wholeness" lies in the formulation of valid principles for systems regardless of the characteristics of their parts or the relationships among the parts of the system (Bertalanffy, 1968). As such, General Systems Theory provides a way of thinking about a functioning system rather than a prescriptive set of propositions (Lederman, 1976).

Another difference between instructional design or systems analysis and General Systems Theory relates to the linear or non-linear nature of each. For example, the instructional designer may start by constructing a test that adequately samples some performance and then write the objectives and design the learning activities. More commonly, the instructional designer will conduct a task analysis, write performance objectives and criterion measures, design learning activities, and identify components needed to make the instructional system operational. The point here is that the steps used by instructional designers and systems analysts tend to be linear.

This linear logic is not followed by General Systems Theory. Rather, General Systems Theory highlights the inadequacies of a linear ends-means view of a system and emphasizes the reciprocal relationships among systems. In social and other man-made systems, the goal of the system may remain constant while the means shift dramatically (Ball, 1978). For instance, the widespread use of computers in elementary and secondary school classrooms could bring about a dramatic shift in means even though the goals of the curriculum could remain the same.

Bertalanffy describes why linear logic is in conflict with the goal of General Systems Theory (1975).

> The goal of general system theory is clearly circumscribed. It aims at a general theory of wholeness, of entire systems in which many variables interact and in which their organization produces strong interactions. It does not deal with isolated processes, with relations between two or a few variables or with linear causal relations.

The purpose of making this distinction is to point to the need to look at the principles of General Systems Theory in order to understand better why educational institutions and programs are as they are. If General Systems Theory has a language rich enough to accurately describe an institution and an educational program, then educational planners have a foundation upon which to build.

THE CLASSROOM AS THE KEY SYSTEM

In order to identify key systems within a larger unit such as a school district, the place in which the work is done that accomplishes district purposes must be determined. Theoretically, this is any place in which a student gains the knowledge, the skills, and the attitudes that are part of the district curriculum. Obviously, the broad scope of this theoretical statement makes it all but impossible to analyze the key systems so defined. More traditionally, the key system is considered to be the classroom, the key components are students, educational materials, and the teacher. If the classroom is considered the key system, learning activities within the classroom then become subsystems and provide the means for attaining class objectives, which, in turn, support the purposes of the school and the district. The role of the district and school relates to the way they support the classroom and protect its integrity.

The classroom provides the environment that can be analyzed in terms of the purposes for which school exists and in terms of the relationships among elements that nurture certain effects. For example, Mary Budd Rowe (1974) at the University of Florida has discovered that teachers wait only a few seconds for the answers to questions they ask students. In her research in the United States and Australia, she found that both the frequency and the accuracy of students' responses dramatically increase when teachers extend the time given to students to answer questions. When a teacher, conscious of this research, extends the time s/he gives students to answer questions in order to improve student performance, the relationships among the elements in the class have been changed to nurture more correct and complete responses from students.

THE INDIVIDUAL AS THE KEY SYSTEM

All living things, including humans, are well-defined, concrete systems. For example, their hierarchical structures are well known (e.g., cell, tissue, system, organism) and their physical boundary is clearly defined, thus permitting careful study of what living systems need from their environment as well as what they contribute (e.g., plants take in carbon dioxide and give off oxygen). These observations prompted Greenebaum to argue that the student is the key system (1976):

> . . . students have clearly defined outputs but unobservable processes; schools have poorly defined outputs but observable processes. A general theory, then, ought to help us think about student processes and school outputs in a way that conventional discipline-bound theory cannot.

The statement seems to ignore the classroom, which is the designated environment in which teaching and learning take place.

Everyone recognizes that degrees of physical and emotional stability in students are necessary prerequisites if students are to benefit from class activities. There are always conditions that facilitate and conditions that obstruct or even make some classroom activities impossible to undertake. There are also drugs that change the human body in such a way that the individual can be made more alert, can be made to remember better, or can be tranquilized. These drugs may affect a student's readiness to learn; however, the actual opportunity to learn depends upon experiences provided for in the environment.

The problem with considering the student as the key system is that educators are likely to pay too much attention to the black boxes and give less attention to the purpose of an educating system.

BLACK BOXES

When understanding an operation or function is unrelated to accomplishing a task, the operation is called a black box. For example, a teacher places a reassuring hand on a child who is attempting a difficult task and the child responds by relaxing and trying again. The act of reassuring does not require that the teacher know the chemical and physical changes that occur in the child's body that caused the child to relax. These changes in the state of the body are called black boxes.

The concept of black boxes can help identify irrelevant information and activities in the curriculum as well as help educators to place priorities on certain activities. For example, an objective of driver training is to teach students to use the brakes properly. Teaching the workings of a hydraulic braking system will not help students achieve this objective. In other words, those who use brakes properly may or may not know the mechanics involved. The mechanism is a black box. The activity with the highest priority is practice during driving lessons with the student behind the wheel.

OPEN AND CLOSED SYSTEMS

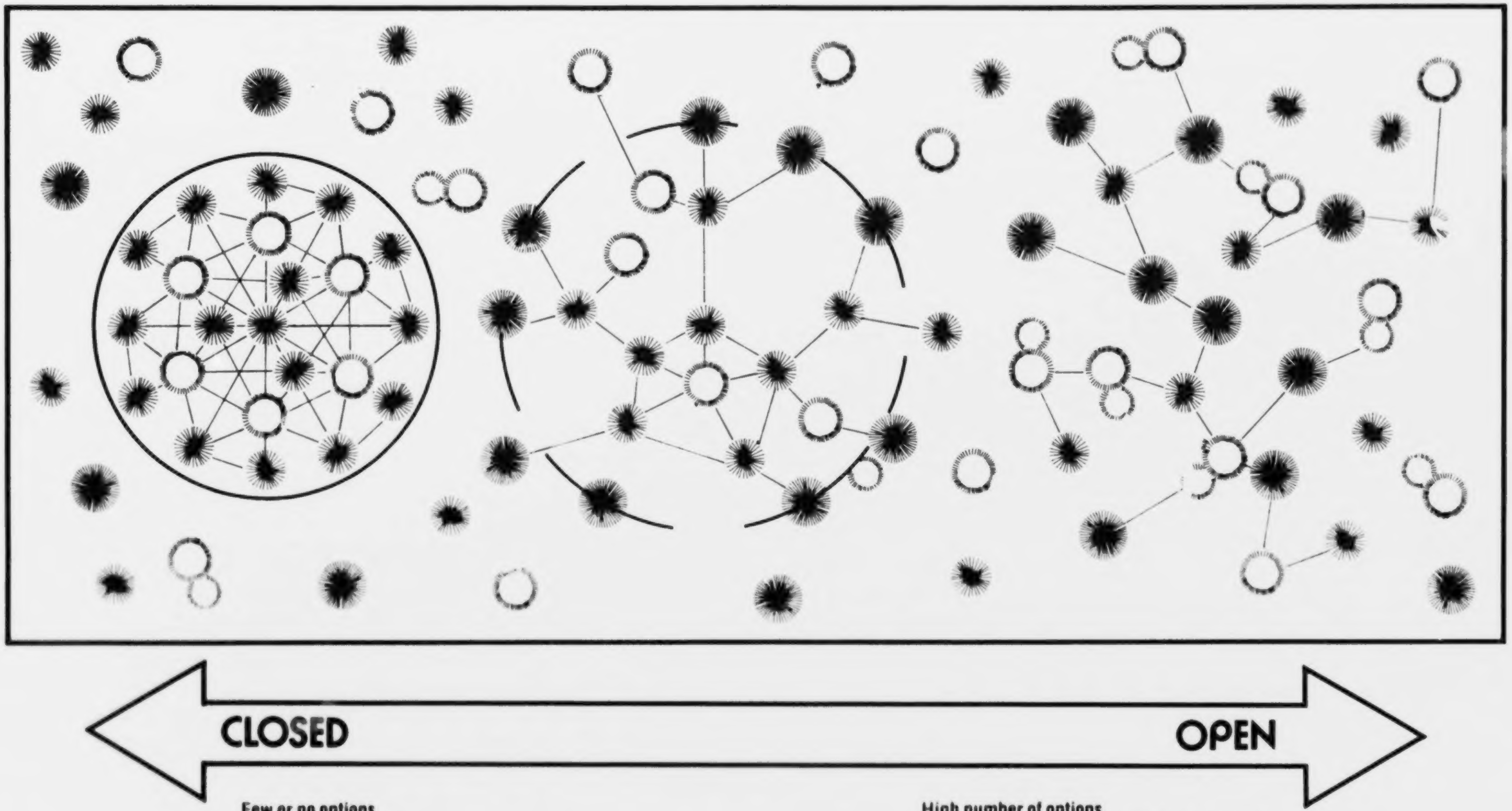
The concept of open system and closed system is confusing in that neither exists in the complete sense of the term. This is because there is not such a thing as a completely open system or a completely closed system. As illustrated in Figure 3-1, a completely open system does not exist because its boundary could not be identified. The completely open system would dissolve into its environment. On the other hand, a completely closed system would be a kind of perpetual motion machine that would never run down. Since neither of these systems exist, thinking about the degree to which a system is open and closed means placing the system on a continuum stretching from open to closed in relation to other systems on the continuum.

As related to a class, school, and district, a system is a complex of physical, personal, social, procedural, and content components interacting for a variety of purposes. The degree to which a classroom is open or closed depends upon the way and degree in which components and purposes relate to the school, district, and community. If there is a high degree of interaction with these environments, the classroom is more open than if little interaction takes place. If there is little interaction and the classroom exists for its own purposes, then the system tends to be more closed.

This is not to say that a closed system cannot serve a purpose for its environment or that all open systems are relevant. In other words, closed systems do not necessarily mean "bad," and open does not necessarily mean "good." The assumption is too frequently made that when one opens up the system, something positive will happen. In education, the open school concept is frequently considered better than the concept of a closed classroom. Questions of efficiency and effectiveness relate to the creative and scientific arrangement of components to achieve purposes. The key is to support the educational system having the most order and strongest relationships among the people, materials, and facilities that support learning. Using General Systems Theory as an argument for creating more open systems is a gross misinterpretation.

The question of open and closed systems within a school district must be resolved by identifying which systems need to be more closed and which need to be more open in order to accomplish their respective purposes. There is no way of going about this in any absolute sense. Nevertheless, some observations seem obvious. For example, one teacher responsible for teaching 35 students in a self-contained classroom having 35 desks and 35 textbooks needs a relatively closed system to maximize the relationships in order to accomplish class objectives. Bells, cold and heat, interruptions, noise and other disturbances can destroy the internal order of the classroom and block progress during a lesson. On the other hand, the office of the superintendent needs many channels to respond to the numerous concerns of individuals and organizations within the community. Consequently, the office of the superintendent cannot achieve its purpose unless it is communicating freely with the

Figure 3-1. Open and closed systems.



Few or no options
Means and ends clear
Needs little communication with supra-system
High degree of internal order

High number of options
Means and ends changing and often obscure
Free communication to and from environment
Internal order flexible

community.

Other characteristics besides the exchange of a system with its environment help distinguish among closed and open systems. For example, in open systems, there frequently exist a number of options in components, procedures, order, and other resources while more closed systems tend to have fewer options. Consider the number of options available to a district superintendent as contrasted to a classroom teacher. The superintendent has control over a wide range of monetary resources, can be at a wide variety of places at any time of the day, and has access to numbers of specialists both within the school and community. The classroom teacher has little or no budget, has a fixed schedule throughout the day, and neither the time for nor access to a wide variety of expertise.

INTERRELATIONSHIPS AMONG SYSTEM COMPONENTS

One way to recognize a system is to note how the elements that make up the system are "communicating" with one another, to look at the relationships among components. For example, as shown in Figure 3-2, four lines of equal length can form a square, the letters TV, or a box with the lid open. The relationships among the lines enable one to interpret what the thing is. In this way, a system is frequently unknown until its organization is understood.

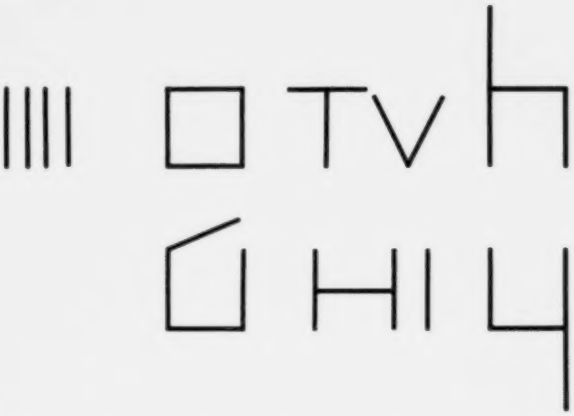


Figure 3-2. Selected ways four lines can communicate.

The general ethos of a class emerges from the interrelationships among components. Hostility, friendliness, motivation, directedness, apathy, sympathy and joy are all products of the relationship among components. These outcomes or products are frequently states that are of non-physical nature (Pia, 1976) and are generally expressed in words (Miller, 1970). In thinking about the classroom in this way, the attributes of the components are far less critical than the relationships that produce these conditions. Consequently, a wide variety of students with great variations in intelligence and background can interact to produce these conditions. However, the attributes of the elements do, in some cases, place constraints upon what relationships develop, the personality of the teacher being a case in point. Miller expresses these ideas in this way (Miller, 1970):

> The spatial structure of the class importantly influences its processes. If students are arranged at desks facing the blackboard or television set, their interactions are different than if they are arranged in a circle or if they are arranged at laboratory benches. The classroom process varies also with the content of the information discussed and the teacher's approach to interpersonal reactions which is often dictated by the teacher's philosophy of education.

Studying the relationships among components of the classroom helps to avoid thinking about a system apart from what the system does. Thinking that a classroom is a classroom regardless of whether it is being used is not very useful. Thinking about a classroom as a place where one might participate in a drama, view a film, enter into debate, conduct an experiment, paint a picture, or play basketball makes more sense. The questions asked by General Systems Theory about such activities relate to how the classroom holds together, achieves its purposes, and moves toward a more optimal state.

If a classroom is highly integrated, each of the elements has strong, well-defined interrelationships. In other words, the facilities, teacher, information resources, and students become critical to students' achieving educational goals. Each component plays a distinctive role in the overall functioning of the classroom (Pia, 1976).

The concept of synergism, synchronized energy, involves the importance of developing systems with highly integrated components (Pilecki, 1972). In other words, a functioning classroom should produce something more than the sum of its parts. For example, the knowledge, skills, and attitudes developed in the various subjects work together to form more and more sophisticated intellectual structures. The concept of synergism might also be used to explain certain types of heirarchical structures. For example, a painting of a landscape is more than color, perspective and design. Valuing is more than a lot of respect, and so on. The principle from General Systems Theory is that as the system becomes more integrated the chances of increasing the synergistic effect of the system also increases.

HIERARCHICAL STRUCTURES

The architecture of any system invariably contains hierarchies which account for the ubiquitious nature of hierarchical structures in General Systems Theory. The levels of the cognitive domain include knowledge, comprehension, application, analysis, synthesis, and evaluation (Bloom, et al., 1956). Classrooms make up schools, schools collectively form districts, and so on. Expressions such as "knowing one's place" and "climbing the ladder" are common in everyday language and in the folklore of all cultures (Milsum, 1972).

Vertical and Horizontal Structures in Schools

The concept of vertical structure is commonly associated with the chain-of-command--the teacher, principal, superintendent--or the kindergarten-through-high school curriculum as shown in Figure 3-3. Horizontal structure frequently refers to the kind and number of teachers that make up the faculty or to the course options available on a specific level.

The vertical and horizontal structures of the curriculum control what a student may be doing at any given level as well as what the kindergarten-through-senior year experience is designed to produce. The clearer these structures are the more the system is in control and the more each person and each activity are vested with purpose and meaning. As shown in Figure 3-3, the curriculum is a planned series of experiences extended over time.

The vertical and horizontal structures of the curriculum show what the options are. What actual experiences students have is related to the way the educational system is organized and supported to make the options accomplish purposes.

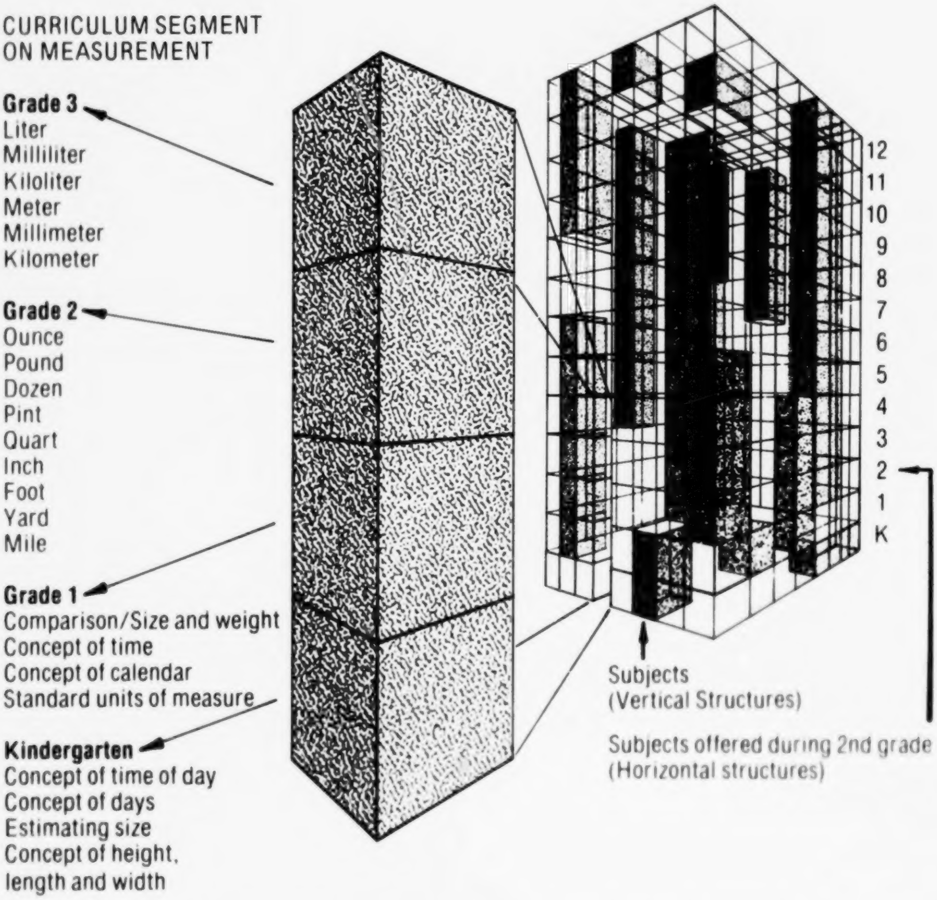

CURRICULUM SEGMENT
ON MEASUREMENT
Grade 3
Liter
Milliliter
Kiloliter
Meter
Millimeter
Kilometer
Grade 2
Ounce
Pound
Dozen
Pint
Quart
Inch
Foot
Yard
Mile
Grade 1
Comparison/Size and weight
Concept of time
Concept of calendar
Standard units of measure
Kindergarten
Concept of time of day
Concept of days
Estimating size
Concept of height,
length and width
12
11
10
9
8
7
6
5
4
3
2
1
K
Subjects
(Vertical Structures)
Subjects offered during 2nd grade
(Horizontal structures)

Figure 3-3. Vertical and horizontal structures of the school curriculum.

Hierarchies in Subject Matter

The vertical structures of the curriculum attempt to match natural hierarchies within the various disciplines. In most sciences the natural hierarchies are visible. In other disciplines, like history and language arts, more artifical structures are used to form hierarchies. Examples include thematic approaches, from simple to complex, from facts to conclusions, by chronological order, and from whole to part. Another order of hierarchy found in the various disciplines relates to the processes used to bring new knowledge to the field. Historians analyze original documents, scientists use the experimental method, and biochemists synthesize DNA.

Another way to look at the hierarchical order in the disciplines is to see that all disciplines are engaged in the study of systems, all of which have hierarchies within them. Thus the social scientist is concerned with systems such as the family, town, county, state, nation, and world; the language arts teacher is concerned with how and why words, sentences, and a sequence of ideas function in a given paragraph; the astronomer strives to describe the complex nature of the universe.

Hierarchies in Human Development and Learning

Educators must comprehend the importance of describing those characteristics of students that significantly affect the relations among components that are needed to achieve learning goals. Student characteristics that affect content, format, and message design are significant. Some of these characteristics need to be considered in curriculum design, others in curriculum implementation, and still others in curriculum evaluation. For example, the middle school curriculum reflects the formative, exploratory nature of the adolescent and his desire to gain group approval. Other characteristics, such as the need for active involvement at the adolescent as well as other ages, are important in the design of teaching and learning activities. In other words, a general understanding is needed of student characteristics unique to each period of the human life span.

Every stage of the human life span presents a unique opportunity to communicate, to learn, and to change, since each stage represents different needs of human beings. For example, the relationships among levels of interaction change from infancy to childhood, from childhood to adolescence, and from adolescence to adulthood. Figure 3-4 illustrates the changing environment of people during various stages of their lives.

The way educators capitalize on the needs of each level can make the difference in whether or not the curricular objectives are realized, needed, and/or accepted. There is no cut-and-dried method for such an analysis: there is only knowledge that will help educational planners act more responsibly, more intelligently, and more sensitively. The purpose, in the context of General Systems Theory, is to improve the relationship among the educating systems components.

For example, early childhood may be characterized as a socialization process. Activities that promote working together, that provide simple structures that are easily followed, that allow all to succeed and to have fun in the process, and that allow for role playing are most appropriate. This is a time when rich and real experiences are provided and talked about. Preschool children and children in the early grades do not want to wait for their rewards. They value what is going on now. Activities that help children come close to their environment will be enthusiastically accepted. A curriculum developing skills such as cooperation, discussion, respect, courtesy, manners, and friendliness are appropriate. This is the time when large muscles are being developed and consequently activities promoting balance, basic coordination, and pace are valuable.

Educational planners must realize that children are bewildered if surrounded by too much permissiveness. Consequently, educational programs for children should provide directions, routines, and consistency. Underlying all activities designed for children should be the realization that children are in search of self; that they need to understand better how they fit into the group and into the community.

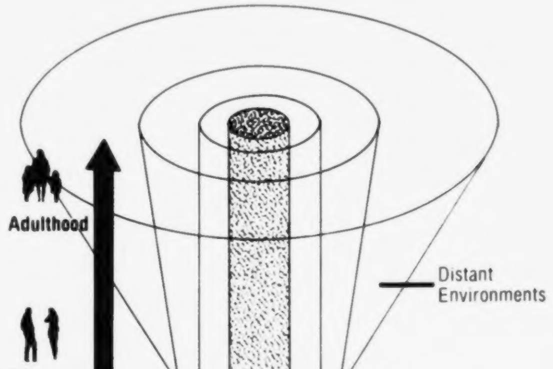


Figure 3-4. Relationships among levels of interaction and human growth and development.

Another developmental hierarchy is the acquisition of language, the relationship to learning to read, and the way language moves a child, adolescent, or adult from the concrete to the abstract. For example, oral language develops first and is necessary before a child begins reading.

Adolescents differ in a number of ways from children. In "Bread and Butterflies: A Curriculum Guide for Teachers" (1974), an excellent audience description exists for nine-to-twelve-year-olds. The television series is designed to help this group understand themselves and the world of work. The teacher guide describes eight characteristics nine-to-twelve-year-olds have in common.

> They have the widest range of interests of any age group.
>
> They are fascinated by realism and facts. Achievement is very important. Success is elating, failure a disaster.
>
> They have begun to question the right of adults to dominate.
>
> They want to make their own decisions and assume responsibility, initiative, and independence regarding things they see as important.
>
> They are beginning to be aware of other people's feelings, beliefs, and ideas. They can understand the concept of fair play.
>
> They find a certain amount of satisfaction in working alone, but they really enjoy group enterprises.
>
> They seek prestige. It is important to be somebody, to do something great, to achieve recognition.
>
> Physically, they are developing body control, strength, and endurance.

Other forms of hierarchies exist in human development and learning. For example, Maslow has structured the evolving psychological and physiological needs of humans. The cognitive, affective, and psychomotor domains have been structured into hierarchies. Another example is the work of Taba. She developed a technique for the hierarchical ordering of questions. The point is that the many kinds of hierarchies which exist help educators to understand what is happening and what can happen.

Competition and Cooperation in Schools

A combination of competition and cooperation is found on each level of the hierarchy from classroom through the school district. However, an important point to note is that competition at one level of the hierarchy may be identified as cooperation on another level (Milsum, 1972). For example, competition among students in the classroom may be viewed by the school as a means for encouraging high student achievement. At the school level, this competition is cooperating with a purpose of the school. In the classroom, the competitive aspects of teaching and learning and the cooperative aspects exist at the same time and tend to reinforce each other. For example, in the school band, the more competitive the band is, the more satisfying the cooperative experience.

Notions of competition and cooperation may explain why innovations intended to change the traditional classroom experience tend to be short-lived. Milsum states the principle from General Systems Theory in this way (1972):

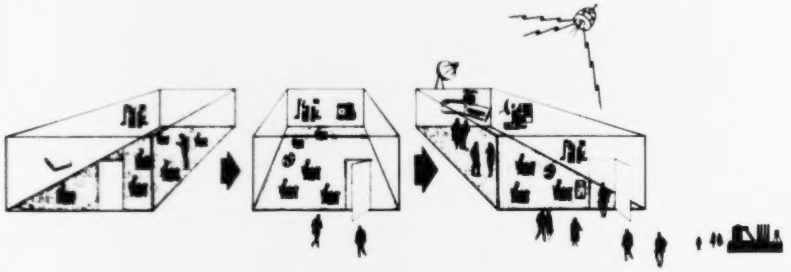
> If particular subsystems of a larger system operate so as to optimize their own individual "good" (performance indices), the net result will almost never be overall system optimization.

Milsum goes on to explain that all of the subsystems, in this case the classrooms, draw upon common resources (school and district). In this sense, the innovation tends to have a greater share of the school and district resources than does the traditional classroom. If this is carried to the ultimate, the common resources could be depleted and result in the mutual ruin of all concerned.

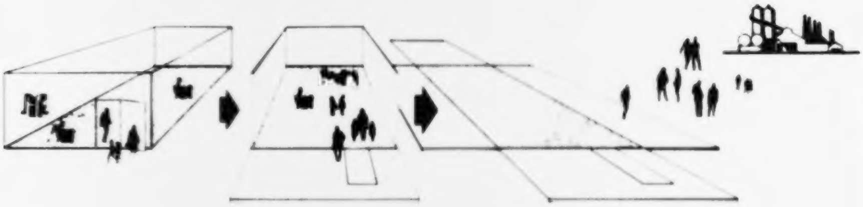
Optimization

The optimal structure and size of a classroom, school, and district relate to the degree of specialization needed on each level of the hierarchy to achieve purposes. The degree of specialization is the key here since specialization is related to the capacity of the system, whereas organizational aspects may be more arbitrary. There are many ways the school can organize its classes, and many ways classes can organize learning activities. Nevertheless, the viability of the concept of the classroom as the key system is tested by its ability to grow in complexity, sophistication, and specialization.

For example, at the turn of the century classrooms contained desks, slates, textbooks, and only a few additional learning resources. Today, two trends can be seen. The first is to bring the world to the classroom with sophisticated facilities, elaborate electronic devices, and information systems, as shown in the top series of illustrations in Figure 3-5. The second trend is to bring students from the classroom into the communities. The question is not, which trend is "better" or "right." The question is, which environment best serves the educational purposes. An important consideration in judging which environment will best serve the educational purposes must take into account **what is practical** and **what provides for optimal control.** In this sense, the great diversity



SYSTEMATICALLY BRINGING MORE OF THE WORLD INTO THE CLASSROOM



SYSTEMATICALLY TAKING MORE OF THE CLASSROOM INTO THE WORLD

Figure 3-5. Two trends in education.

among classrooms is related to the many purposes for which each exists and attests to the soundness of the original concept of the classroom.

Stability

Concepts describing equilibrium, homeostasis, and steady state are used to ascertain the stability of a system. All systems have some mechanism which helps maintain stability. A simple thermostat used to maintain a constant temperature is an example of such a mechanism. The legislative, judicial, and executive branches of government provide another example. The purpose of these mechanisms is to return the system to its original state when changes occur which disrupt a system's stability.

The number of such mechanisms that exist to protect the classroom system in public eduction accounts for its stability. In most states, the classroom teacher is the one who is legally responsible for instruction. The administrative rules and personnel are designed to protect the classroom and to maintain its stability. Any innovation that strays too far from the normal classroom concept seems to have little chance of success for the classroom always returns to the traditional in response to the continual pressure from the existing powerful mechanisms.

Stability in the classroom or in other systems may be maintained in at least three ways. First, the environment can change. For example, the school is the immediate environment of the classroom. In open schools (schools without walls), the boundaries that separate classrooms are missing. When this causes problems the school can use bookshelves, portable blackboards, screens, and other devices to establish boundaries between classrooms and to simulate the privacy of the classroom. Second, the system can change internally in order to increase its ability to regain stability. Sending a disruptive student to the office is an example of this type of internal change. Third, a combination of internal and environmental changes may take place to bring about greater stability. For example, a new science curriculum was introduced into the middle school. Teachers were not properly prepared to implement the new curriculum and began experiencing a number of problems. Students were not obtaining the proper results from experiments. Teachers could not answer the questions students had about many of the new concepts, and so on. This caused a great deal of frustration, uncertainty, and sometimes chaos. In order to correct the situation, the district organized a series of workshops planned to overcome these problems. The workshops were designed to change both environmental as well as internal order and thereby establish a higher degree of stability in the classroom.

As far as classrooms and schools are concerned, the more energy that is spent in establishing and maintaining corrective mechanisms the less likely educational purposes may be achieved. There are many examples that illustrate this point. Too many restructions placed on students using the school library media center will begin to defeat the purpose for its existence. Teachers who constantly bring mechanisms into play to keep discipline obviate many activities which are easily managed by classroom teachers with few discipline problems. Even though an activity may be absolutely essential to gaining a particular understanding, if the teacher feels that students will be in physical danger because of their lack of discipline, the activity will most likely be avoided.

Notions about stability perhaps reveal a basic myth many educators hold--the larger a school the more effective and efficient the educational program. A large school saves the district money because the district does not have to duplicate expensive facilities. Facilities are better utilized in larger schools. A large school can provide a more diverse curriculum and thereby meet the needs of more students within the community and so on. However, large inner-city schools usually spend much more money and energy to protect property and to provide for the safety of students than do small schools. In fact, few mechanisms are needed to protect property and to provide for the safety of students in schools small enough to allow every student to know every teacher and every teacher to know every student.

Some corrective mechanisms used in the classroom help provide more ways for students to achieve personal and program objectives. Such mechanisms may be designed and employed by teachers and students or be present in educational materials. For example, the teacher may re-teach a lesson using different examples because students failed to perform satisfactorily on a test, a student may make up and work multiplication problems to increase this skill, and a piece of programmed instruction might have a remedial loop for students that need certain prerequisite skills before they can proceed. In these instances, the type of corrective mechanism employed also increases the equifinality of the classroom.

Equifinality

Man rarely, if ever, creates a perfect, ideal, or best system. This means that there are always alternatives to manmade systems, that there is more than one way to accomplish a purpose or to proceed from here to there. In other words, the final state of any open system can be reached by starting from a number of different initial conditions and through a variety of means. This principle from General Systems Theory is called equifinality.

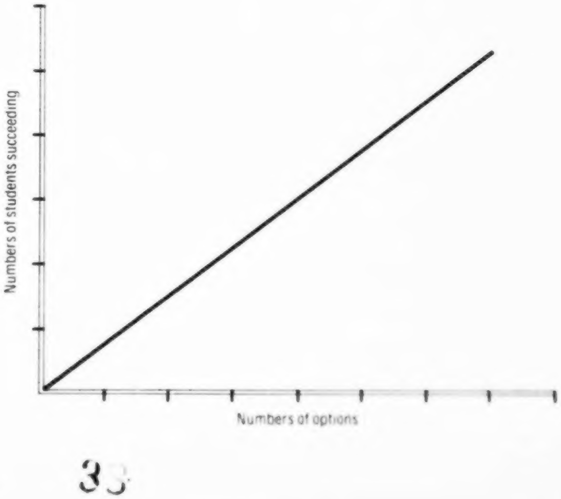
The equifinality of a system increases as the number of alternatives increases. A system also increases its ability to adjust to unforeseen changes in its environment as the system increases the number of ways it can achieve its purposes. Most importantly, as shown in Figure 3-6, as equifinality increases so does the probability that a system will accomplish its purposes and that students will succeed.

Many efforts to apply General Systems Theory in education do not show an understanding of the principle of equifinality. Efforts aimed at curriculum reform almost always attempt to replace the old system with a new or more fashionable system. Furthermore, when alternatives are developed within schools, they frequently exist as separate or competing entities when they should be considered as increasing options for students. For example, teachers too frequently fail to relate films to the lesson. The film stands as an independent system buying time for the teacher to correct papers or do some other chore. Another example comes from the experience of team teaching. Team-taught classes were generally regarded as competitive with traditional classes. The question is, which is best? The question should be, what part can educational films and team teaching play in the curriculum?

Notions about individualizing instruction do seem to increase the equifinality of an educational system. This is especially true if the classroom and the school provide numerous ways for students to learn through a variety of media and through the use of many teaching and learning strategies. On the other hand, if individualized instruction is conceived to be a student working endless hours at a computer terminal, then the principle of equifinality is ignored.

Understanding the principle of equifinality ought to increase the value educators place upon alternative ways to learn and decrease educator's preoccupation with trying to prove that this way is better than that way. This principle suggests that the greatest need is to increase the instructional

Figure 3-6. Equifinality.



repertoire of teachers. This is understood and explained in Models of Teaching (Joyce and Weil, 1972):

> Models for teaching can help a teacher build up his capacity to reach more children and create a richer and more diverse environment for them. They can help curriculum-makers plan learning centers and curriculums which offer to children a variety of educational alternatives. They can help materials makers create more interesting and effective instructional materials and learning sources.

CONCLUSIONS

The use of General Systems Theory, instructional design, and systems analysis has become fashionable during recent years. Unfortunately, these rather distinct efforts have become confused by writers, instructional materials developers, and curriculum workers. General System Theory provides the terminology for describing a whole, dynamic system while instructional and design and systems analyses tend to be step-by-step procedures for producing a product and/or achieving a goal. In other words, General Systems Theory tends to point to the inadequacies of a linear ends-means view of a system and emphasizes the reciprocal relationships among systems, subsystems, and suprasystems. Nevertheless, the literature seems to indicate that educators frequently confuse and/or use interchangeably instructional design, systems analysis, and General Systems Theory. Only a few efforts have been made to use General Systems Theory concepts such as equifinality to describe educational programs.

The key system within a district seems to be the classroom; however, this notion is rarely explored. Instructional design models tend to concentrate upon the production and validation of instructional products or the generation and implementation of a particular course or curriculum. The place in which the work of the schools is most always performed, the classroom, is badly neglected. The original design of the classroom appears amazingly versatile and capable of providing the environments necessary for the kinds of teaching and learning tasks that schols undertake.

In summary, the first step in using General Systems Theory seems to be missing--namely, to use concepts from General Systems Theory to develop a new understanding of why and how schools achieve what they achieve and behave as they do. To use General Systems Theory to justify a new program or to point to inadequacies of traditional schools neglects using General Systems Theory for the purpose it was intended and creates a situation in which practice is frequently in conflict with the theory that supposedly supports it.

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Chapter 4

A Place in Space: ID's Universe

Roberts A. Braden

Instructional development is the central concern of this book. It is the center of focus of most of our jobs. It forms the center of conversation when we meet. But instructional development is only one part of educational technology; and educational technology is only one part of education—an invisible part, in the view of many educators.

This chapter examines the implications of this situation, and, hopefully, will restore a balance to the thinking of those of us who, in our own view, have become stars in the ID Universe.

The sun revolves around the world (which is flat). I know that it is flat because I observe the sun as it rises each morning, as it moves in a sweeping arc across the sky and as it sinks beneath the edge of the world each evening. "Seeing is believing," says the old cliche, and I have seen it. Absurd? Yes, seeing is worth believing only when your assumptions are believable. So let us begin again.

Who knows what revolves around what? Well, in the astronomy of education there is a great universe known as DET (an acronym for Domain of Educational Technology). At the very heart of the DET universe is the most sparkling of all of the galaxies, DIT (another acronym, this time standing for Domain of Instructional Technology). Yes, and if you believe in this brand of astronomy, within DIT there is a solar system of functions known as ID (most readers will recognize this as the acronym for Instructional Development).

If all of this is beginning to suggest to you that a fantasy is being described, please continue and reserve your judgment. At this point do not be overly concerned that Id is a cartoon nation with a wizard and a little king and that id in Freudian psychology is the primitive psychic apparatus from which come the ego and superego. ID (all caps) has its wizards, its leaders (though none are kings), its egos and even its superegos. It also has its place in space, but whether that place is at the epi-center of education is a matter that bears closer examination. And that, dear reader, is what this chapter is all about.

Most educational technologists today would concede that instructional development (ID) is a term that represents a process highly steeped in theory. the process assumes ideals and fosters logic. Instructional development is also a profession that performs identified functions within the domain of instructional technology. In the educational technology community there is very little uncertainty about the general nature of ID. There is a high degree of agreement about the concepts that are central to the identification of the profession, the description of the process, and the definition of the term. There is much disagreement about the periphery. The edges of the ID concept are fuzzy. That is, there is no consensus--and there may never be—concerning the limits of the process or the boundaries of the profession.

These uncertainties couse us periodically to reconsider where ID "fits" into the overall scheme of things. Such a reconsideration will be presented here.

THE CHINA SYNDROME

The name "China" is a somewhat distorted transliteration of the Chinese characters jung (pronounced almost "jeeng" in the Cantonese dialect and gwa. Jung means center. Gwa means country. Together jung-gwa (jeeng-gwuh--soon distorted to cheen-uh) is the name the Chinese gave to their own country. The Chinese ideogram for jung started out as a graphic representation of the world with a line through its center--all of which makes sense because the mandarin mentality held that China was the center of the world. Modern Chinese tend to think so, too.

A tendency to think of oneself, one's activities, or one's interests as being at the center of things is the Real China Syndrome-(X). Of course, self-centeredness is not restricted to the Chinese. It is pervasive in the field of education, where Syndrome-(X) may explain the proliferation of such terms as teacher-centered, program-centered, and student-centered.

Self-centeredness is also well known in systems-approach circles. Systems people who, in the words of Ivor Davies, "are in love with boxes and arrows," are also likely to be infected with Syndrome-(X). A symptom of the combined afflictions of box-and-arrowitis complicated by Syndrome-(X) is an uncontrollable urge to design relationship diagrams which create the illusion of centrism. Syndrome-(X) sufferers always put their own "thing" in the center--where else? (From an existentialist view, the center would therefore be expressed as "my thing" or "our thing.") The resultant view of the big picture thus resembles Figure 4-1. (Substitute appropriate labels from the professional jargon, please.)

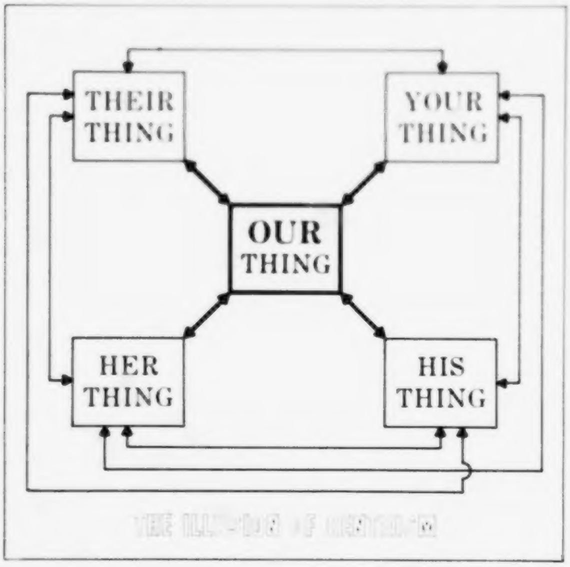

Figure 4-1. A self-centered systems model, with boxes and arrows.

Syndrome-(X) explains in a somewhat frivolous way why faculty developers tend to place faculty development in the middle of things; instructional developers like to put instructional development at the heart of things; organizational developers...well, you get the idea. Individuals who have even moderate spatial-relation skills will recognize that any box in figure 1 could be manipulated into the center without changing the relationships.

Models which focus upon anybody's thing are useful. The inherent weakness of models of this sort is that the outer lines and arrows tend to get lost. Thus, over time, the illusion of centrism can cause people to lose sight of the functions of some of the components of the real system. More about that later...

Whereas the Chinese consider themselves to be at the center of the universe, for many years the United States government took the official position that China did not exist at all. We Americans did not "recognize" China. Diplomatically we defined a world which ignored a big chunk of real estate and a billion people, give or take a few. We were neither fantasizing nor doing something wildly unusual. We do the same sort of thing all the time within the academic sector by defining the world in ways which serve our own purposes. The practice has been called operationally defining, delimiting, and fancier things like "setting the background" or "establishing the context." I would prefer to give another name to the practice of defining and describing any incomplete reality: Real China Syndrome-(Y). The name is not entirely whimsical. The China example is a good one and the phenomenon recurs often enough to be called a syndrome.

The important thing that Syndrome-(X) and Syndrome-(Y) have in common is that both syndromes encourage thinking about partial realities as opposed to total reality. The syndromes are the product of procedures that serve usefully as aids in considering several variables. However, it is not the utility of the syndromes that concerns me as I contemplate the place-in-space of ID. Rather, it is the mischief that could and does occur when we mislead ourselves or fail to consider something because it was arbitrarily left out. Syndrome-(X) hovers as a threat that we might design a model that slights the most important function of the educational system by placing it too far towards the periphery. Syndrome-(Y) with its temptations is a reminder that nothing can safely be left out because education does not operate in isolation, nor do the functions within education exist in isolation. When we consider ID in the light of Syndrome-(X) we discover that not only is ID not at the center of the universe in which it resides, it is not even immediately adjacent to the center. When ID and Syndrome-(Y) are considered, we find that there are many components of the system which interact with ID, and should be considered.

THE UNIVERSE OF LEARNING MODEL

The Universe of Learning Model, as its name implies, is predicated upon the realization that student learning is at the center of the educational universe. Having learning at the center of focus is not so much a novel idea as the restoration of a good idea to a place of prominence in our thinking. With student learning at the center of the universe of concern, a model has been constructed which portrays the relationships of the several components of that universe. Figure 4-2 is the first phase of that model.

At this point an important distinction should be made. The Universe of Learning Model is neither student-centered nor teacher-centered--it is learning-centered. To be sure, learning is done by the learner and in that respect the model is more student-centered that teacher-centered. The fact that the model does not concern itself totally with students as individuals is not intended to be an affront to humanistic concerns or to diminish the primacy of the student in the total process. Rather, the model is intended to be a graphic representation of relationships.

More than any other variable, student attributes influence learning. Therefore student development has been given a place in the model with a direct connection to student learning.

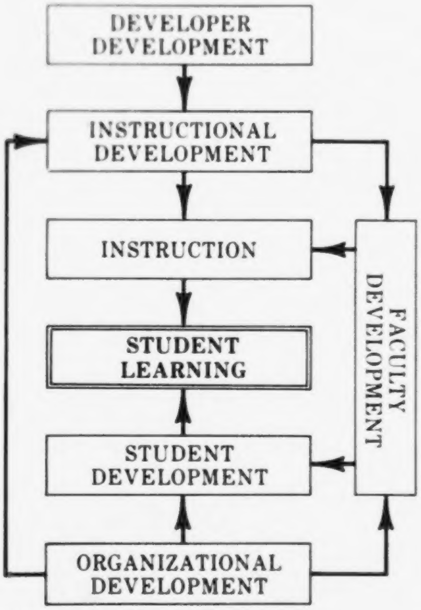

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Figure 4-2. The universe of learning model: I.

STUDENT DEVELOPMENT

The term student development (SD) as used here is given broad meaning. The attitudes, the skills, the aptitudes of the learner all contribute to the successful learning experience. The term itself is a recent addition to the instructional developer's lexicon. Hand (1978, 1979) and Bass (1979) introduced SD as a logical conceptual addendum to the instructional development/faculty development/organizational development categorization scheme.

Generally speaking, the SD concept relates to any of a large number of activities, events, strategies, processes, or whatever, that will bring about a change in the skills or attitudes of the learner or will enable a more efficient application of a learner's aptitudes so as to increase learning. If you like the mechanical metaphor, SD can be stated more simply; it is anything which provides the student with additional learning tools. As a primitive concept, SD is an area about which we know too little and about which we may never know enough. Our educational system is unlikely any time soon to change from an emphasis upon the teaching of content to one of fostering what Hand (1979) would call the "development of the student's learning capabilities (both skills and attitudes) to the maximum potential." Even if there were a mandate for such a change, it could not be accomplished easily. There are no widely accepted procedures for helping people to learn how to learn. That should not be accepted as an ongoing excuse, however, for indefinitely ignoring the potential of SD. Recent research concerning the training of students in the use of appropriate learning strategies has provided results which Snowman (1979) believes warrant the inclusion of learning-strategy courses in school curricula.

INSTRUCTION

Another major variable affecting learning is instruction. The term instruction, too, is given wide meaning as applied to this model. It includes all of the hyphenated and adjectively-modified variations of the term, such as self-instruction and programmed instruction.

The concept of instruction can be operationally defined as a limited procedure by fettering it in caveats, but in the system of relationships shown in Figure 4-2 this function, as depicted, is unfettered. In this sense instruction can be accidental or planned, wandering or purposeful, personal or impersonal, managed or uncontrolled, traditional or innovative, and so forth. The exact procedures involved in instruction are not at issue here--it is the relationship of instruction to the other functions in the universe of student learning that is central to this discussion. As a matter of passing interest, however, in the model shown, the expectation would be for a purposeful, systematic, efficient, appropriate, giving of knowledge by one person to another via a suitable medium of communication.

The student takes the instruction. then, through some internal process which can be enhanced by SD, learning occurs. When the concept of instruction is linked to predetermined purposes, that is, when instruction becomes intentional (as it usually does), then the role of faculty as managers of instruction can be related to the role of instructional developers as facilitators of managed instruction. With that introduction, we arrive at "the place in space" of ID.

INSTRUCTIONAL DEVELOPMENT

In this volume, at least, it is unnecessary to define or describe ID. The hoped-for result of ID is effective and appropriate instruction. Neither the recipients of the instruction (students) nor the presenters of the instruction (usually faculty) may care a great deal about learning theory, cost effectiveness, the mechanics of individualizing according to aptitude, achievement, or style, and/or a host of other considerations that go into the design of effective and appropriate instruction. That is why ID has a place in this model. ID directly influences the quality of instruction by being that functional part of the system which is concerned with all of the things that go into instruction.

ID also indirectly influences instruction by contributing to faculty development (FD). Some FD programs literally consist of instructional activities for faculty. In the best of all worlds, instruction-for-faculty would receive the same scrutiny from instructional dvelopers as would any other instruction. In a less obvious way, ID contributes to FD any time a faculty ID client gains a better appreciation of quality instruction and a growth in personal instructional skills while participating as a content expert in an ID project.

There is no line and arrow in Figure 4-2 from ID to SD. Theoretically there could be. For example, learning skills must themselves be learned, and the instruction required to bring about that brand of SD could be developed through an ID product. Going in the other direction, student learning could be fostered by involving selected students in the ID process, developing instruction for their peers. At this time, however, neither of these ID-to-SD scenarios is likely to be realized.

DEVELOPER DEVELOPMENT

The ways in which an instructional developer influences instruction are inextricably linked to the personal makeup of the developer. That includes the way in which s/he was prepared for the profession and her/his professional and personal growth since that time. The makeup of the developer also includes aptitudes, attitudes, and attributes which are beyond the scope of the goals pursued by programs for professional preparation and development. Mostly these are characteristics which were developed prior to entry into professional preparation and thus need not be discussed here; their effects upon professional performance, and so ultimately upon student learning, however, should not be ignored.

Whereas Faculty Development (FD) is concerned primarily with those things which affect the faculty member after her/his entry into professional service, Developer Development (DD) includes a concern for all that occurs during the period of professional preparation as well. This concern has recently been reflected in the efforts to bring about certification. The much-touted benefits of certification will not come easily to the field of ID because the only thing standard about ID training programs is that they are all nonstandard. There is no definitive textbook for use in teaching ID at any level, although the report of Miller and Naumer (1979) identified a host of different materials (135 items) being used around the country. That is the bad news.

The good news is that the ID literature as a whole is rich. The preliminary report by Rossett and Nimis (1980) of their interviews with professional instructional developers revealed that "there was not a single indictment of our professional literature." Rossett and Nimis also reported that there are four prevailing options to follow in the training of instructional developers: "university programs, field experiences, print materials, and contacts with colleagues and friends." There may not be enough standardization to allay all the fears aroused by the prospect of certification, but DD is alive and well. Thanks to the work of individuals like Rossett and Nimis our conceptions about the origins of instructional developers are changing. DD is no longer viewed as unidimensional or single-faceted. The DD system seems to be providing the opportunity for both preprofessional experience and for ongoing professional development. Articles and chapters have been written and papers presented on the substance and methods of teaching ID, as for example those of Patridge and Tennyson (1979), Colton (1978), and Braden (1977).

Of even greater significance may be the trend towards an increased flow of manuscripts and presentations on how the developer performs her/his role in the helping relationship. The advent of a special issue of the Journal of Instructional Development devoted to consultation, headed by Barry Bratton's powerhouse article, "The Instructioinal Development Specialist as Consultant," (Bratton, 1979) is a milestone in the maturation of a DD system that provides competent professionals whose ability to perform the ID function is constantly improving.

As shown in Figure 4-2, the functions of preparing instructional developers and of providing for their ongoing professional growth, collectively called developer development (DD) are not the same as the ID functions themselves. Because DD requires prospective and practicing instructional developers to learn and to continue to learn, it would be nice to think that the best "developed" instruction in the university curriculum is that used to prepare instructional developers. Unfortunately, this appears not to be the case.

No single institution is likely to initiate its own full-service DD program. The concept and the term DD are introduced into this model because, with theoretical expansion and detailed explication, the idea might be useful as the basis for a profession-wide program. for example, a three-faceted DD paradigm would accommodate (1) the methods of DD that Rossett and Nimis have identified, (2) the recipient populations of DD (professionals, faculty, and students) and (3) differentiated levels of DD including at least a distinction between the theory-strategy and the technical levels. A sound certification program would benefit from such a paradigm as part of its bedrock.

FACULTY DEVELOPMENT

The relationship of faculty to instruction is clear. Faculty provide instruction. That is not news. Faculty have been providing instruction for a long, long time. Today, however, there are many more options and variations open to faculty pertaining to the methods by which instruction may be provided than there were in the past. To take full advantage of these options many changes would have to be made. Some of the changes might have to occur to the faculty persons themselves. Without doubt, any changes in faculty members will in some way be reflected in the instruction they provide. When we talk about "changing" faculty members we are talking about faculty development (FD).

There is no general agreement as to what constitutes FD. The definition in the AECT glossary is so pejorative that is isn't very useful. The definition by Francis (1975) is better:

> Faculty development is an institutional process which seeks to modify attitudes, skills, and behavior of faculty members toward greater competence and effectiveness in meeting student needs, their own needs, and the needs of the institution.

There is a tendency by some writers to think that FD is the whole "ball of wax" as far as instructional improvement goes. Rose, et al., (1977) commented upon the use of FD as an umbrella term. "As variously described in the books and articles cited..., faculty development includes instructional development, organizational development, and personal development." Braden and Terrell (1978) took issue with those who might equate ID and FD. The reasoning, which clearly stated that "Instructional Development and Faculty Development are not the same things," should have been extended to clarify that ID is not a subset of FD--the opinions of FD writers to the contrary notwithstanding!

The matter seems so simple that it is almost embarrassing to explain it, but perhaps it needs doing. Point: ID leads to changes in instruction. Point: FD leads to changes in faculty members. Point: ID and FD may take place concurrently, but they may also be completely separate. Point: An ID program may assume FD responsibilities and vice versa. Conclusion: ID and FD are functionally different but mutually supporting and neither inherently includes the other!

Some of the confusion of purpose surrounding ID and FD is reflected in the observation by Gow (1980) "Universities are interested in imparting design skills to their faculties as part of burgeoning faculty development programs." That doesn't make ID a part of FD. Consider this parallel example: some FD programs have mini-courses to help faculty members learn to use computers. Nobody is claiming that computer science is part of FD. We should not confuse the things that faculty learn in FD with the FD function.

Returning our attention to Figure 4-2, the importance of FD should not be minimized. Next to the students themselves, faculty are the most important actors in the learning drama. Faculty members whose "development" enables them to be more effective as they provide instruction will unquestionably have a greater positive impact upon student learning than will those who lack such "development". Also, faculty members whose "development" enables them to help their students become more efficient learners will be contributing immeasurably to student learning. In this latter role as facilitators of SD the faculty member may be a contributor to an institutionally-sponsored SD program or s/he may be an independent SD agent.

ORGANIZATIONAL DEVELOPMENT

Organizational Development (OD), like the other "developments" discussed in this chapter, lacks neatness. The process, which varies from case to case, is, therefore, procedurally untidy. In an academic world where random growth and change are more the rule than the exception, OD proponents can be overwhelmed by a system that breeds chaos and tends toward anarchy. In such an environment, we should rejoice that, unlike ID, which gets operationally redefined with almost every second scholarly article, OD has been left virtually undefined--at least as OD applies in the Domain of Educational Technology. The one notable exception is the definition generated by the AECT Definition and Terminology Committee (AECT, 1979).

> **Organizational development.** A long range organization-wide, organization-sponsored effort to plan and implement controlled

> change in the organization through the use of applied behavioral science techniques; organization development differs from more traditional planning in that its intent is to change the beliefs, attitudes, and values of the organization and, in some cases, the decision-making process. Organization development views the organization as both a social entity with extensive human interaction as well as a system with its own purposes. OD makes use of people who act as "change agents" or "catalysts."

Somewhere in the educational literature there may be several operational definitions of OD which this author has overlooked. That is not the point. Rather, it is significant to note that educational technologists who have written about OD have either taken definitions from the business sector or have accepted the term "organizational development" as self-defining. The result has been a linking of personal interests, and thus a sharpening of emphasis, by various authors unrestricted by any broad but immutable definition. The license offered has produced interesting perspectives.

Berquist and Phillips (1977) consider organizational factors that affect motivation. As such, they portray OD as an area of activity which concerns itself mainly with the conditions of work. Specific concerns are for such things as group dynamics, the interface of the people dimension with the imperatives of the organization, and the structures and processes of the institution as these factors are linked to the motives of the faculty.

Abedor and Sachs (1978) limit their emphasis to organizational readiness (for change). They have suggested that there is a symbiotic, spiral relationship between ID, OD, and FD. In postulating this relationship Abedor and Sachs identify OD as an influential force in bringing about organizational readiness and relate this idea to five specific characteristics which influence organizational decision-making: structure, policies, rewards, norms, and resources. Without going into detail, Abedor and Sachs have noted that in instances in which a selected innovation requires a level of readiness that exceeds the existing level, "OD activities may be conducted concurrently with ID activities to ensure acceptance of the innovation." The clear implication here is that whoever is making ID decisions in these cases must also be able to shape or influence the structure, policies, etc., of the organization.

Gaff (1975) conceived OD as being of such broad character that its principles could be applied to any kind of organization--educational or otherwise. However, when he identified OD as one of the three rubrics that he would use to categorize the widely-held alternative conceptions of instructional improvement, Gaff limited OD directly to education. Two of the four purposes that he listed for OD were to "Create (an) effective environment for teaching and learning;" and to "Create policies that support effective teaching and learning." In his book, Toward Faculty Renewal, Gaff also discusses the basic assumptions and propositions of OD. The last topic on that list introduces the concept of planned change as an aspect of OD:

> Most organizations can be improved by a periodic review of their functioning and by initiating a process of planned change. The several steps in such change include diagnosing a problem, devising a plan that will solve the problem, implementing the plan, evaluating the effectiveness of the effort, and revising the plan in light of the evaluation.

The literature associated with organizational development indicates that organizational development can have several definitions. Of the three definitions that this author offers below, the first is the most passive, the second is the most descriptive of the symbiotic relationship with ID, and the last is the most pragmatic.

> **Organizational Development (OD):** (1) The changes in an organization as brought about by both internal and external forces. (2) A program* intended to foster goal-oriented, systematic changes in an organization. (3) A set of processes and procedures that form the modus operandi for operating an organizational development program.*
>
> (*NOTE: The term "program" implies an on-going effort. For one-time activities the term "project" could be substituted.)

A word of caution: we must not imagine that the tail wags the dog. OD is not a subset of ID. Policies flow downward in organizational hierarchies. In contrast, an idea for a policy change may originate at a lower level.

Similarly, the impetus for change may emanate from a mid-level or low-level change-agency within an institution. These are examples of upward influences. They have popular appeal. Still, in practice it may not be so. Policy changes tend to come from policy makers. Policy makers cluster at the top. Therefore, Figure 4-2 shows OD "input" into ID, FD, and SD with arrows that flow one way only. But in some organizations (and ideally) the system of governance is such that the OD-to-ID and the OD-to-FD arrows should show reciprocal input/output.

The point about the direction of the arrows should not be taken as trivial. Sad fact: The diagram in Figure 4-2 does not provide an accurate picture of the existing system at very many schools or colleges today. Thus far, only a few of our educational institutions in the course of their organizational development have made an organizational commitment to ID and FD. Even fewer institutions have made organizational provision for SD.

The literature on OD is growing rapidly. An annotated bibliography of 124 items has been prepared by Rose, Nyre, and Marantz (1977). The scope of the literature is broad, but its aggregate emphasis on human interaction, satisfaction, and effectiveness reflects a continued bias toward the parent literature from the business sector. There seems to be no doubt that in time OD will be strengthened as an area of concern in education. As Rose et al., (1977) have commented, "Organizational development affects the entire institution, as change in one area necessarily precipitates change in other related areas." The Universe of Learning Model shows the areas which are related to student learning so as to emphasize that the vitality of the OD effort (including receptivity toward change) is of primary importance to the evolution of healthy ID, FD, and SD programs.

Organizations do not exist in limbo. For that reason OD can be seen not only as an area of concern for inner change, but also as a conduit to the outer world, the context within which the organization exists.

CONTEXT DEVELOPMENT

It has been more than a decade since the concept of context evaluation was first introduced (Stufflebeam, 1968). The importance of this contribution to the expansion of applied systems theory should not be underestimated. In a sense, an entirely new dimension was added. Let me illustrate this using the most basic cybernetic (systems) model.

In Figure 4-3 each of the three boxes provides an obvious place to superimpose one of the four elements of Stufflebeam's CIPP model. According to Stufflebeam's (1971) own definition, CIPP is "An acronym formed from the first letters of the four basic kinds of evaluation: context, input, process, product." Notice how neatly input evaluation coincides with input itself in the first box, how process evaluation overlays the second box labeled 'process,' and how product evaluation logically would be applied to the output box. That leaves only context evaluation to be located in the cybernetic model. Referring again to Stufflebeam (1968),

> Context evaluation would be used when a project is first being planned. The major objective of context evaluation is to define the environment where change is to occur, the environment's unmet needs, problems underlying those needs, and opportunities for change.
>
> ......
>
> Information from context evaluation lead ultimately to the establishment of program goals and objectives.

Referring to the key words in that statement, notice a concern for entry into the model ("first being planned"), the establishment of "environment" as a near-synonym for context, and a concern for the future of the model ("where change is to occur"). That brings us to the point at which the basic cybernetic model can now be graphically shown merged with CIPP (Figure 4-4).

Much that is implied by context evaluation has been widely accepted in ID methodology. Throughout the several preliminary steps of the ID process, those activities collectively categorized as "front-end analysis," context evaluation is an operant factor. In particular, those procedures which are sometimes identified as needs assessment draw upon an evaluative process which looks outward at the environment surrounding and encompassing the educational setting.

Up to some point, examination of the en-

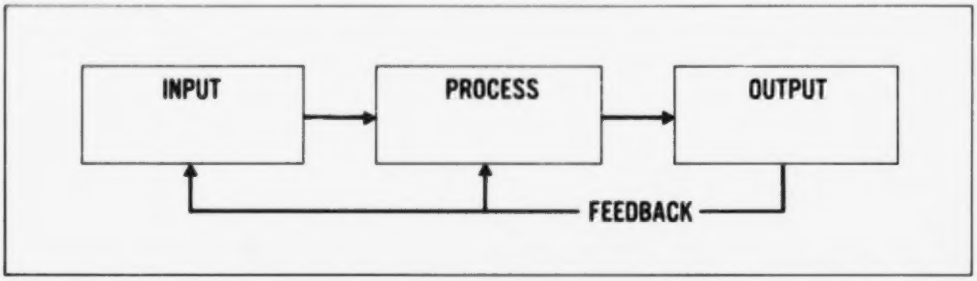

Figure 4-3. A basic cybernetic model.

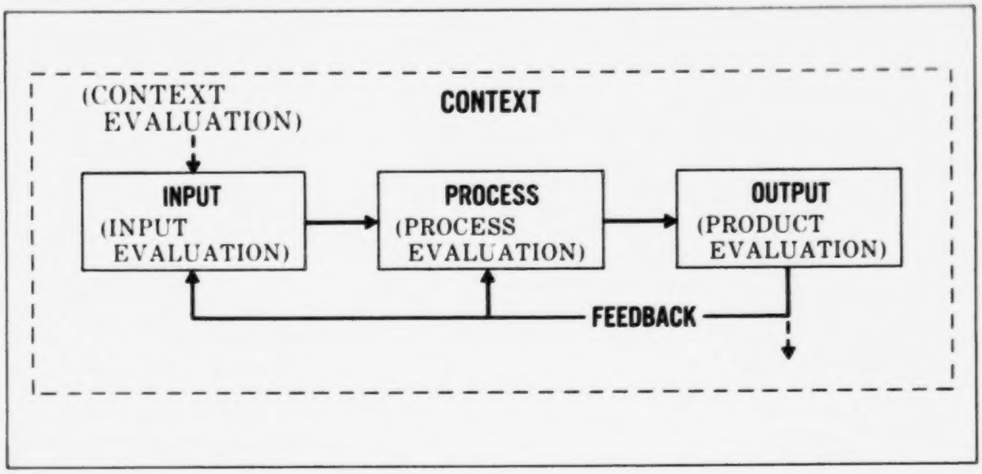
(CONTEXT EVALUATION)
CONTEXT
INPUT (INPUT EVALUATION)
PROCESS (PROCESS EVALUATION)
OUTPUT (PRODUCT EVALUATION)
FEEDBACK

Figure 4-4. CIPP applied to basic cybernetic model.

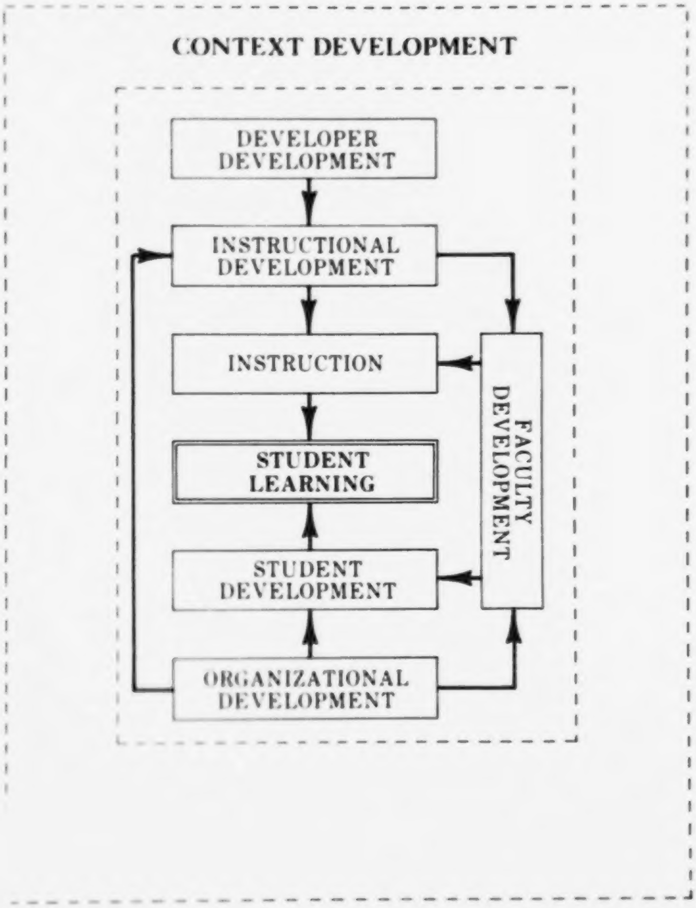
CONTEXT DEVELOPMENT
DEVELOPER DEVELOPMENT
INSTRUCTIONAL DEVELOPMENT
INSTRUCTION
STUDENT LEARNING
STUDENT DEVELOPMENT
ORGANIZATIONAL DEVELOPMENT
FACULTY DEVELOPMENT

Figure 4-5. The universe of learning model: II.

[illegible]

vironment is an ID procedure. Keep in mind, however, that once that amorphous point is reached, the context beyond is no longer directly integrated into the ID process. The hazy nature of the resultant boundary confounds the attempt to describe precisely the universe in which ID exists. In Figure 4-5 a new term, context development (CD) is introduced. The imprecise boundaries and, to a degree, the sense that an environmental context can have no set boundaries, is reflected in the way that context development is graphically presented. The "encompassing" nature of the portrayal is intentional. The vagueness of the lines as limits is intentional. The ability to interpret the image as either two boxes or as a surrounding ring is fortuitous, but useful, in explaining the appropriateness of CD as a concept to be juxtaposed with all of the other "developments" contained in this model.

First, pursuing the astronomical metaphor offered earlier, a view of the dashed lines as two boxed--one within the other and both surrounding the rest of the model--lends itself to a suggestion of inner space and outer space. The inner space notion sparks the idea that all of the "spaces" between the various components of the model are capable of being developed. Following this line of thought, we could project the possiblity of the separate boxes growing together over time. Such a conjecture about growing together is interesting, but must be seen as distinct from the intended implication of the model: that the effects of the various components should come together in order to promote student learning.

The outer space interpretation lends a aura of all-inclusiveness, far-reaching impact, openendedness, and the like. If we keep in mind that "context" was initiated into our universe of concern by Stufflebeam and that his 1971 definition of context evaluation said that, "This type of evaluation is systematic and macroanalytic..." (emphasis added), the bigger-picture view gains credence. However, Stufflebeam also included in his definition a repetition of his 1968 thought that context evaluation defines the environment. By this he seems to mean that defining is tantamount to identifying a universe of concern. That is fine for evaluation. Nothing could be more appropriate. Yet, in the Universe of Student Learning Model, "defining" cannot be allowed to have an interpretation that would imply restricting, limiting, or excluding (as in defining that which is "in context" and excluding that which is not).

Consider now the other way that CD can be viewed from its graphic presentation in Figure 4-5 -- as a ring (band, strip, track, donut) surrounding the central components of the system. This view is in many ways the preferred view, but we must approach it with care because it is a view that can be somewhat deceiving. Specifically, the ring interpretation might erroneously lead a reader to believe the central components themselves are not a part of the total context. All of the components of the model are part of the context. The named components, however, are selected parts of the whole environment and may be discussed apart from the greater context--as they have been in this description of the model.

So far this discussion has been limited to establishing the meaning and relevance of context. What about the expanded term, "context development?" A place to begin would be with definitions:

> **Context Development (CD):** (1) The changes in the environment brought about by natural and human forces. (2) Planned programs of action by an individual, group, agency, organization, or profession to influence environmental changes.

Notice that the first definition of CD, like an earlier OD definition, is passive. Some things happen and there is very little mere mortals can do to prevent or change them. Lack of control, however, is no reason for indifference. If it looks like rain, we can carry an umbrella. In a more positive vein, if we think that it is going to rain periodically all summer, we can plant a garden. The point is that we need not be able either to plan or to control change in order to take advantage of its opportunities or to minimize its adverse consequences. Consideration of impending unplanned and uncontrolled events and contingency planning are, therefore, important aspects of all of the "developments" in our model and are particularly relevant to CD.

In Figure 4-6 three contextual change categories are shown in the overall-gray area of CD. An example of the more active brand of CD identified by the second definition, above, would be the government relations program of the Association for Educational Communication and Technology (AECT). As representatives of the profession, AECT personnel could testify--lobby, even--for the passage of a congressional bill to fund an R&D project. The project could succeed, adding to our knowledge and maybe also provide new technology for instruction. An unlimited number of other scenarios are possible, but are not necessary to make the point that it is possible to influence the world "outside"

Three brief, somewhat related examples of ways in which we can use CD by anticipating the developing context will serve to anchor each of the last three boxes in the completed Universe of Learning Model. Some conjecture is present in each example.

Example number one: Random access videodisc technology is virtually upon us. The equipment, with provisions for obtaining software, may soon be both available and affordable. The ID practitioners will either by ready to plug into the potential of this technological breakthrough or they will not. The chances are good that they will be ready if DD functions as it should.

Example number two: Anticipating the po-

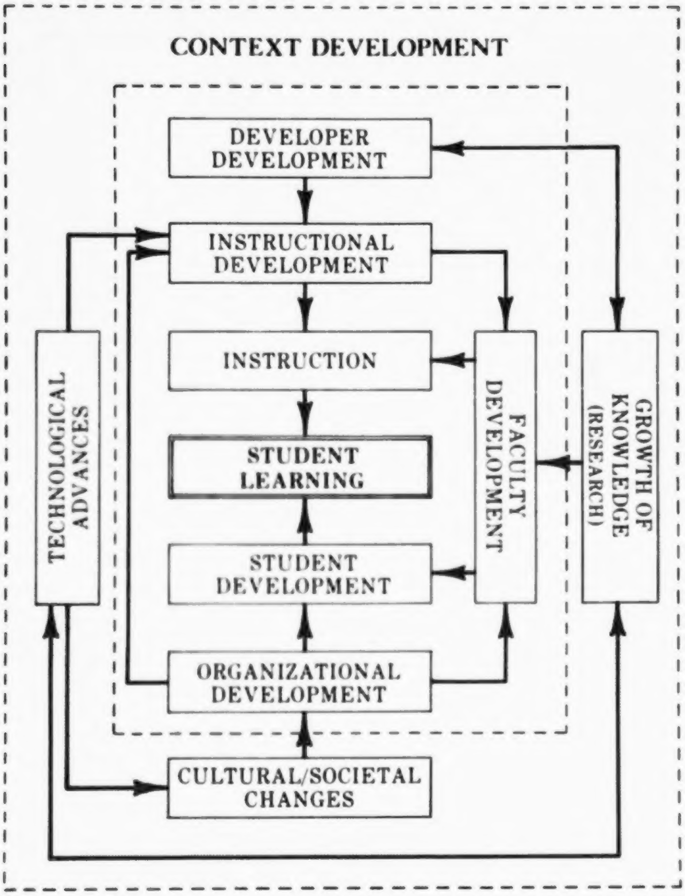
CONTEXT DEVELOPMENT
DEVELOPER DEVELOPMENT
INSTRUCTIONAL DEVELOPMENT
INSTRUCTION
STUDENT LEARNING
STUDENT DEVELOPMENT
ORGANIZATIONAL DEVELOPMENT
CULTURAL/SOCIETAL CHANGES
TECHNOLOGICAL ADVANCES
FACULTY DEVELOPMENT
GROWTH OF KNOWLEDGE (RESEARCH)

Figure 4-6. Active context development.

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tential of video-discs, an advanced doctoral candidate in a DD program could set up an experiment which would test potential applications of video-disc technology as a medium for disseminating new research findings to faculty members in biology (or some other discipline). Results of the research would contribute to DD, perhaps would cause changes in FD, and might also have impact upon the further development of video-disc technology itself (if technical performance data were gathered and shared with the manufacturer).

Example number three: Video-disc technology has the potential for revolutionizing data storage and retrieval. This, in turn, may cause radical changes in our habits, in our value systems, and in our need to go to central repositories of knowledge in order to gain access to information. To meet these new conditions, ID, FD, and SD programs would require major alterations. The OD program is projected in Figure 4-6 as being the change agency which would sponsor and coordinate program alterations throughout the system.

SUMMARY

The educational sun does not revolve around ID, but it would be hard to dispute that ID is a bright star in the educational heavens. By redirecting our attention to the basic fact that student learning is the only reason for the existence of the entire educational universe, it has been possible to build a model showing the relationships among the major components of the system which supports student learning. There may be agony amongst a few super-advocates of ID because ID ended up two squares away from the center of things. But still, this is ID's universe, and it seems to this author that ID is not diminished by the place into which it fits.

As a parting thought, let me suggest that there are alternative ways of considering the relationships delineated in this chapter. If you are willing to posit that student learning will take care of itself, (a risky assumption, in my opinion) then I offer one final model for your consideration. It

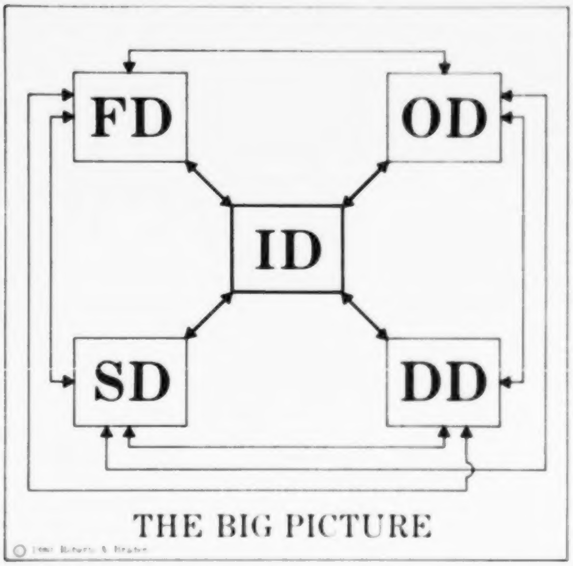

Figure 4-7. Instructional context development (ICD) model.

should require no further explanation. I call it the Instructional Context Development Model (Figure 4-7). Any similarity to a previous model is purely intentional.

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Chapter 5

Instructional Development: The Social Implications of Technical Interventions

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David F. Leitzman
Earl R. Misanchuk
Wellesley R. Foshay
Kenneth M. Heitland

The evolution of ID techniques through the years has been punctuated by an emphasis on scientific analysis and a constant striving for strong theoretical underpinnings. But have we carefully considered the fact that all ID efforts take place in an existing social system and thus all ID efforts are social interventions? What are the implications of the wedding of "social analysis" and "technical analysis" for the future of ID?

SOCIAL ISSUES IN ID

What is instructional development? What do those who use this label actually do? Perhaps an appropriate response is that instructional developers are social activists in scientists' clothing. Developers are almost always about the process of using scientific knowledge to invent pragmatic solutions to instructional problems. These instructional problems have significance for manufacturing plants, colleges, and hospitals alike in that, if left unresolved, they can reduce that organization's effectiveness. In some cases the reduction may be minor, while in others it may be serious enough to threaten the organization's survival.

Our experience* in dealing with such instructional problems suggests that technical responses must be combined with social responses if improvements in performance are to result. The instructional design process compels us to pay attention to the social domain because no change in an individual's behavior leaves the environment unaffected. In addition, elements of the social structure within which instruction occurs mediate our improvement efforts. When members of an organization cannot make group decisions, we must not only try to introduce technical innovations such as agenda setting and concensus building, but must also acquire sufficient knowledge of that group to enable us to combine and incorporate these techniques into a social design that will encourage their use by group members. In this way the practice of instructional development is one of integrated social and technical responses to instructional problems. Thus we become social activists as we serve as instructional technologists.

Changing views concerning job design and the quality of working life provide useful insights into the sociotechnical nature of instructional design. The work of Davis (1977) leads us to see that the hardware and software of any technology are not pre-ordained; both are products of the assumptions about people, machines, and society held by the designers. For example, developers seldom consider that eliminating instruction is sometimes the best way to improve instruction. Replacing the maxim of "technological determinism" with an understanding of the assumptions which drive our practice avoids the trap of the self-fulfilling prophecy, thereby enhancing the possibilities for a realistic solution.

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*We will use personal pronouns to differentiate assertions based upon our collective experience from conclusions drawn from research.

Focusing upon both social and technical elements of an intervention exacerbates the complexity with which developers must deal. Recasting "givens" as assumptions adds to the ambiguity and uncertainty of outcomes as well. This larger model, however, better describes the reality of the contexts within which developers operate, making problem aspects clearer and easier to anticipate.

The developer's practice will often be cast in a pragmatic language of goals, objectives, analyses, instructional strategies, and evaluations. Such language results from an applied scientific orientation focused upon creating reasonably objective descriptions of the causes of and solutions to instructional problems. Our experience suggests that developers analyze problems **logically** using a wide range of research, pose solutions **creatively,** then confirm the effects of their work **scientifically.**This perspective implies a complex professional role that is practiced in a wide variety of organizational contexts, under many different professional rubrics, and with a rich variety of professional styles.

We hope in the next few pages to describe aspects of a process which many developers employ. We will focus upon both technical and social functions which are often included in that process, emphasizing some that we feel have been neglected in past descriptions. Clearly, our view of our profession adopts a more socially-oriented set of assumptions than those of others (Baker and Schutz, 1971; Tracey, 1971; Carey and Briggs, 1977; Dick and Carey, 1978; Goldstein, 1974). In several instances we attempt to make these assumptions explicit.

This article includes a description of several issues that are involved in managing the development process, including a consideration of consulting style. A review of formal analytic functions follows, focusing upon learner and task analysis. The specification of instructional strategies is described briefly. The final section reviews current literature dealing with the evaluation of the products and processes of instructional development.

MANAGING THE DEVELOPMENT PROCESS

The following example may be helpful in illustrating our concept of management. Consider the case of a large commercial firm with manufacturing and sales divisions organized under a single corporate headquarters, which includes a combined organizational and instructional development staff and facility. The vice president for sales calls the development group to arrange a training program for his regional sales managers. He argues, quite strenously, that his managers are not well versed in supervisory or motivational methods. Because his managers are working in a highly competitive and demanding market, he feels that a tailor-made program is required to solve this "training problem." A professional in the instructional development group is assigned to meet with the vice president and assess the potential for building a working relationship.

The Developer as Consultant

How might the instructional developer begin? Perhaps by recognizing that **how** one helps others is as important as the technical procedures used to resolve instructional problems. The consultation process mediates an instructional developer's ability to resolve instructional problems.

This notion requires that we begin to think of the developer as both a helping professional and an instructional technologist. One's professional competence, then, must grow beyond the use of instructional development techniques to include the **planning of social interactions** for benefiting those seeking help. The diffusion literature of the 60s is replete with examples of the social impact of instructional innovations. Anticipation and management of this impact enhances the effectiveness of instructional efforts. Others have recently explored this perspective's value (Blake and Mouton, 1976; Caplan, 1970; Kurpius and Brubaker, 1976; Goodstein, 1978).

A developer has at least three general styles from which to choose when preparing to help others. First, one might respond to a call for help with prescriptions of action believed to result in the elimination or reduction of an instructional difficulty. Many authors label this the prescriptive or "doctor-patient" model. Alternatively, one might accept a client's diagnosis and proposed solution, then provide the required knowledge, skills, or products. This approach is often called the "product" or "purchase" model.

A third approach, outlined by Schein (1969), is particularly attractive to instructional developers. Typically, developers are ignorant of the instructional content relevant to a client's problem. This compels a search for a design process which can resolve the problem and its symptoms. The developer thus chooses to collaborate with a client in an attempt to jointly identify a problem, plan for its resolution, and judge the success of mutual efforts. In this approach, the developer's task is to model a generalizable process, thereby teaching that process to the client. If successful, this collaborative style strengthens the competence of the client as it contributes to the resolution of the problem. It also limits a client's dependence upon a developer's expertise.

The choice of consultation styles is difficult. Certainly the choice should not fall to chance, nor should the developer's preference be the sole criterion. One guide to selecting an appropriate style might be found in the different boundaries that client, consultant, and their respective organizations erect and sustain. These boundaries structure the environment in which the development process is to be used, often constraining the problem-solving behavior of both developer and client. A client's confidence in his own content expertise, for example, may preclude consultation other than by a collaborative approach.

Rutt (1981) has observed that developers engage in a wide variety of consulting roles across a number of organizational contexts. It would seem that developers intuitively adapt to a complex array of organizational and individual variables in establishing their consulting styles.

Recent Developments

Empirical explorations of the helping process as practiced by instructional developers have yet to form a substantial research area (Durzo, Diamond, and Doughty, 1979). Related inquiry into some of the psychological dimensions of helping and of being helped has been summarized by Lau and Blake (1974), Gergen (1974), and more recently by Bar-Tal (1976). Such research, conducted in settings and under constraints not encountered by developers as they try to assist their clients, seems to offer little direct guidance.

Consulting behavior, nevertheless, is beginning to attract substantive inquiry. Kaplan's (1979) review of situations in which process consultation has been used suggests that it may not always result in client's improved task performance. Porras' (1979) review of several intervention techniques used in educational settings finds them to be less effective than has often been assumed. Such research contributes to the refinement of the developer's helping behavior by suggesting limits within which particular styles and methods are effective.

Who Is the Client?

Having considered how help might be provided, a developer's concern shifts to the determination of just who is to be helped. Those requesting help are not always the most appropriate clients. Our example suggests the vice president to be a sponsor of change which will affect others; he is not the focus of such change (Lippitt and Lippitt, 1978). The regional supervisors, apparently lacking current supervisory and motivational procedures, seem to be the focus of training intended to modify their behavior. They appear to be the legitimate clients with whom the developer should work.

What if the developer were, however, to identify the vice president as the client? Together they might plan a substantial training program employing written materials and other media. Yet little desirable change would likely result. The intervention would have been guided by an individual whose behavior had not resulted in a performance deficiency. The regional supervisors, with their own concept of "the problem," should be directly involved in the design of any change program.

What Is the Problem?

Our example suggests another issue to be resolved once the method and focus of help have been determined. What is the cause of the **performance deficiency**? The vice president defined the cause, or "problem," to be the supervisors' inadequate knowledge of supervisory and motivational practices. Do these perceptions accurately describe the problem, or are they but symptoms of a more deeply-embedded problem?

Making distinctions between symptoms and underlying problems is of critical importance for the success of any instructional development effort. It is frequently difficult to extract such distinctions from a client's perceptions. True problems may be identified from the gaps that exist between valid goals and actual conditions experienced by the client. Valid goals also lead to specific objectives that, if reached, result in goal attainment (Burton and Merrill, 1977; Leitzman and Sisakhti, 1980; Mager, 1970). If symptoms are treated instead of problems, the intervention may well fail to attain the client's goal.

Returning to our example, if the developer had considered the possibility of such underlying problems, those who would directly benefit from behavioral change would have been involved in an effort to estimate conditions as they are and as they could become. The 'real' clients would then have been involved both as collaborators in the intervention's design and as the consumers of the instruction which they designed. This involvement might well lead to the realization that instruction which focused upon changes in the supervisors' behavior would alone prove insufficient to eliminate the problem. A structural change resulting in an **increase** and **refinement** of the organization's **reinforcement** of supervision might also have been required. Providing individuals with the knowledge to attain valid goals might then have meshed with the organization's revised efforts to sustain appropriate behavior. Efforts to modify behavior in or the structure of organizations have been described as comprising organization development (Aplin, 1978; French and Bell, 1978; Schmuck and Miles, 1971). Just as they are not psychotherapists, **instructional developers are not specialists in the complex set of procedures practiced within this area of inquiry.** We argue, however, that developers must have sufficient proficiency to recognize and explore organizationally-moderated constraints acting upon a client's instructional effectiveness. They must be able to view the instructional problem within the context of the entire system of environmental influences upon performance. In this way, developers can work to improve conditions within organizations so as to enhance teaching and learning while reducing organizational variables limiting competent instructional performance.

Recent Developments

We find instructional development to present both developer and client with complex problems. An explicitly negotiated project agreement can enhance their resolution. Such a document serves both the client and the developer by describing the relationship which they hope to create and sustain as they work to resolve the difficulties before them.

Our agreements include the identification of all persons who are to be actively concerned with the development effort, their roles, the goals they hope to attain, and the specific objectives to be reached in pursuit of these goals. These agreements also indicate the resources to be acquired and how they are to be used. The administrative procedures to be used in managing the developer-client relationship, an indication of the evaluation procedures to be used, and the method for renegotiating elements of the agreement are also specified. We do not view such agreements as legal documents, but rather as a way of organizing both social and technical concerns through a single process that facilitates continuing mutual understanding.

The nature of the client-developer interaction, the nature of the problem, and especially the resources to be gathered and applied to that problem (Milstein and Smith, 1979) are renegotiated as necessary. This flexible redefinition of elements and functions in the development process encourages a search for feasible social and technical solutions. Our discussion has excluded important considerations such as cost-effectiveness estimates and time-management procedures. Doughty's (1979) recent review of such issues may prove helpful. Our exploration of the relationship between needs, goals, problems, and symptoms is treated in greater detail by Kaufman and English (1979). There are few reports on the design and use of development agreements, an emerging element of the instructional development process (Leitzman, Walter, Earle and Myers, 1980).

FORMAL ANALYSIS: LEARNERS AND TASKS

Analysis functions include the formal, theoretically-based, restructuring of an instructional problem in terms of a learning, instructional, or related social-science theory. In Table 5-1, the typical states of formal analysis, with corresponding examples from Gagne's (1977) instructional theory, are listed.

Gagne's theory is one of the first to significantly influence the practice of development. It is an excellent example of an applied form of scientific behavioral analysis. However, in recent years a number of alternate formal models have emerged. The developer now has a number of models from which to choose when resolving an instructional problem.

As noted, developers are not in complete agreement in describing the superordinate functions of instructional development. Many developers view task analysis as their primary function, while others include learner analysis as a separate and equal function. We hold the latter position.

Learner Analysis

Glaser (1973) and Schwenn (1973) have argued that there are three basic approaches or models in learner analysis which closely parallel three fundamental viewpoints in psychology: individual difference theory, behaviorism and cognitive psychology. Following these viewpoints, learner analysis may be described in terms of selection, pre-knowledge and aptitude-treatment models. The selection model will be familiar to readers who have encountered entrance exams for admission to educational institutions or tests for personnel placement. The pre-knowledge model, most commonly used by developers, involves the diagnostic assessment of entry behavior and subsequent placement of students in an instructional setting following the analysis of learning tasks. The aptitude-treatment model suggests that two or more instructional strategies may be differentially effective across the range of an aptitude measure. Students could then be taught using a strategy that is best suited

Table 5-1.

Steps in Analysis	Examples following Gagne (1977)
1. The creation of a new simplified problem statement	Students are to apply the rule------in solving math problems of the form----
2. A restructuring of the problem in its component parts	The prerequisite behaviors are delineated
3. A new model is created	A hierarchy of the learning task is defined
4. The model is tested against reality	The hierarchy is validated
5. The implications of the new model are stated	Learning conditions are specified

to their aptitudes. Developers using this model try to create "different instructional strokes for different folks." Unfortunately, the aptitude-treatment model is as yet seldom used because its underlying theory is not sufficiently developed to reliably suggest its successful application.

Interestingly, each of the learner analysis models reduce student failure if successfully applied. In selection analysis those who have a predetermined probability of failing are excluded from instruction. The person is matched to the task. In pre-knowledge analysis, failure is reduced because the learner begins a task at a level matched to his level of performance or understanding. The task is adapted to the learners. In aptitude-treatment analysis, aptitudes and cognitive processes inherent in the treatment are simultaneously analyzed so that learners are assigned to optimal educational treatments. Both the task and the learner undergo adaptation.

Although each of the three learner analysis approaches can result in reduced student failure, the **social** consequences of employing the three methods are dramatically different. In the selection paradigm we include only those learners (as measured by "relevant aptitudes") who have a high probability of success. Failure is in the form of students excluded from the instructional system. The social costs here can be considerable. Most readers are aware of the social controversy that results. Our cognitive-aptitude tests are substantially influenced by the cultural content from which they were derived. Therefore, the tests serve as class barriers to entry into those instructional systems that use them. However, when the systems accomodate this problem and create separate sets of prediction equations for minorities, there are members of the majority who are excluded, but who would have been included without the special affirmative-action process. In addition to these social problems, there are others. Typically the use of such a system coincides with an aura of elitism around those who are admitted. A peculiar form of Social Darwinism prevails. This state of affairs is ironic if not tragic for those excluded when the prediction technology is moderately unreliable, socially biased, based upon invalid instruments, or poorly managed. In many cases the "less capable" or "no more capable" are admitted to instructional systems at great social costs to the institution, to those admitted and to those rejected. For example, many medical, dental and other health-related fields are finding the integrity and technical competence of successive graduating classes are declining for a variety of reasons, including: 1) science and math grades have been obtained fraudulently, 2) science and math aptitude is independent of social sensitivity or concern, 3) the science and math measurement devices are in part socially biased, and 4) the science and math predictors are not well linked to the criterion of a successful physician or dentist.

Social problems are not peculiar to selection technology, however. There are also social implications for a system of pre-knowledge analysis. Some learners simply learn some content more slowly than do others. In an expensive instructional system such as a medical school, the social costs would be substantial, because "slower" learners would prevent "faster" learners from occupying their student positions. Some "slower" learners would conceivably take two or three times longer to complete a "mastery-oriented program." Also, pre-knowledge programs are typically individually paced, sequenced in a linear pattern and devoid of social interactions. These strategies are not necessarily consistent with producing creative, social or divergent understandings, or for teaching learners who have strong preferences for other forms of learning. Most developers have had at least one experience with the social consequences of advocating a form of analysis or a strategy that is widely variant from the norms of the instructional system or students' styles. The consequences are typically painful whether or not the advice is accepted.

Although aptitude-treatment technology is still underdeveloped, some social consequences have been anticipated there as well. Messick (1973) has observed that consistently-differentiated treatments which would capitalize only on the explicit, obvious outcomes of instruction would be too focused or narrow. Students would not have an opportunity to remedy deficiencies built into the treatment, thereby restricting their development. Also, the cost of differentiated treatments on a large scale for numerous segments of the instructional community would dramatically increase our instructional costs.

The point of all this is that the social consequences of our technologies evolve from fundamental assumptions about learning and individual differences. It is important to recognize the social implications which are embedded in our choice of technical tools. We must trade off technical and social effectiveness with precision if we are to avoid doing serious harm to our clients and decreasing effectiveness. We may finally have arrived as a profession when we realize that our tools have as much potential for harm as they have potential for good.

Recent Developments

Selection analysis is best described in the personnel field's literature. The Handbook of Industrial and Organizational Psychology, edited by Dunnette (1976), is a useful introductory reference.

Many recent developments in pre-knowledge analysis concern criterion-referenced testing. Fundamental psychometric problems involved in making individual placement decisions with a limited number of diagnostic test items have spurred this interest. Popham (1978 a, b) summarized the debate concerning this form of testing in a recent issue of Educational Researcher.

Aptitude-treatment interaction research and analysis is presently an active area of inquiry (Cronbach and Snow, 1977). Snow (1977) has recommended the use of several aptitude constructs and related measures as a routine part of most development projects. The constructs which seem to contribute most reliably to aptitude-treatment interactions are achievement motivation, anxiety, and crystalized, fluid, and visual intelligence.

Task Analysis

Analysis of the goals of instruction, including the specification of performance criteria, is almost always a basic function of instructional development. The analysis provides appropriately detailed information for the subsequent design of instruction and evaluation. The tasks so specified are usually jobs, parts of a job, or intellectual tasks in which a student is expected to have demonstrated proficiency upon completion of the relevant segment of instruction. The emphasis in the analysis is upon describing the actual requirements and structure of the task. Frequently, this description is at variance with the established "expert's" account.

Gibbons (1977) classified twenty-five different task-analysis procedures according to the characteristics of the task to be analyzed and the phase of the analysis process at which each procedure is applicable, ranging from the preliminary needs assessment through the most detailed content specification. Additionally, these techniques vary in the way in which they display their results and in the assumptions one makes about the ensuing instructional design and evaluation. Practicing developers typically choose from among the available techniques based upon a combination of pragmatic and theoretical considerations. For the purpose of examining social consequences, learner- and task-analysis models are interrelated. Behavioral models can be linked to pre-knowledge models and consequences. Information-processing models are often used in aptitude-treatment analysis. These techniques also vary in their suitability for different developer/client relationships, and in their costs and benefits for the project-setting at hand.

Recent Developments

The most recently developed task-analysis techniques exemplify more comprehensive analysis; attention to the underlying structure and processes of learning tasks; improved integration of task analysis with specification of training requirements, job design, instructional design and evaluation prescriptions; and improved precision of analysis.

Expanded comprehensiveness is apparent in many modifications of classical behavioral analysis techniques. In content analysis, many modifications have been proposed to Bloom's taxonomic structure of objectives (Bloom, 1956; Krathwohl, Bloom and Masia, 1964). Williams (1977) has proposed an alternative structure for the Cognitive Domain and reports improved facility in designing instruction across the entire range of cognitive tasks. Foshay (1978) has argued that the usual three-domain (Cognitive, Psychomotor, Affective) analysis of learning experiences is incomplete and that increased precision can be obtained by replacing the affective domain with four others (Social, Emotional, Aesthetic, Spiritual). In job analysis, a comparable refinement of behaviorally-based taxonomies is apparent in the techniques reviewed by McCormick (1976). In both the content-based and job-based techniques, the stated advantage of the more complete and detailed taxonomies is the systematic identification of a wide variety of factors which can influence the efficiency and effectiveness of instruction and evaluation.

Attention to the structure underlying the subject matter (content) to be learned is a second trend. In approaches exemplifying this, emphasis is upon teasing out the attributes of the concepts to be acquired, the structure/process relationships among them, or both. Analysis of the task by means of behavioral objectives, then, is done as a second phase (if at all) in order to assist in operationalizing instruction in, and evaluating acquisition of, this structure.

Perhaps the most widely applied structural-analysis technology is concept analysis (Tieman and Markle, 1978). In this approach, content is analyzed into its component chains and concepts. The critical and variable attributes of each concept are identified, and the hierarchical relationships among concepts are specified (the hierarchies are not comparable to Gagne's (1977), however). Instruction is then, by means of a series of concept-acquisition tasks, based upon specified design principles.

A system for more complex analysis of concepts has recently been described by Merrill, Reigeluth, and Faust (1979). In this technology, content is analyzed into its component facts, concepts, procedures, and principles. It is argued that five levels of learning task apply to concept acquisition. Crossed with the four types of content, a matrix results which is then used as a guide for the complete task analysis and the detailed design of instructional treatments and evaluation procedures.

A more radical alternative for analysis based upon a particular information-processing theory of cognitive psychology is advocated by Scandura (1977). He maintains that content can most appropriately be represented as a hierarchical structure of rules, and that learning is essentially the acquisition of higher-order rules, which in turn structure rules already learned so that they may be assembled to guide actions toward a given goal. In performing his analyses, Scandura explicitly stays within the known capabilities of human information processors. From a different perspective, attention to structure/process relationships has also been apparent in the application of systems analysis to work organizations. For example, Stephens

(Wood, Stephens, and Barker, 1979) has adapted Fault-Tree Analysis to the improvement of organizational effectiveness.

Improved integration of the product of the analysis with the subsequent design of instruction and evaluation is a third trend. Particularly in the work of Markle (1969), Merrill et al. (1979), and Scandura (1977), explicit theory-based attempts have been made to tie task analyses to prescriptions for instructional treatments. Integration has also improved in job analysis (Holden and Lescop, 1978). As integration improves, the need for the developers to make an intuitive leap from task analysis to the reality of the instruction or training settings is reduced.

Finally, a trend toward increased analytic precision can be noted among these new techniques. For example, the structure/process techniques enable the developer to pay close attention to the acquisition of concepts by the learner, to interpret errors made and to adapt instruction appropriately. However, only as data become available from the applications of these technologies to a variety of instructional problems will it be possible to demonstrate that the precision thus gained is not false, and that the efficiency and effectiveness of instruction can be improved in this way.

The potential power of these techniques, however, also carries implications for the developer/client relationship. Our experience suggests that developers must match task-analysis strategies to client characteristics as carefully as to the requirements of the instructional design and evaluation processes. Task analysis is by its nature a collaborative effort between the developer and the client or subject-matter expert (SME). Consequently, it frequently provides an occasion for improving the client's sophistication about the entire ID process. Thus, the developer must select analysis techniques which can be used appropriately for client development, which will foster clear communication among those involved in the project, and which will be effective with the given project resources and within its constraints. These selection criteria are in addition to the more clearly-defined need for interface of task analysis with the information requirements of particular instruction and evaluation strategies.

SPECIFYING INSTRUCTIONAL STRATEGIES

We have noted that creating instructional strategies is often an intuitive process. Many authors have discussed this state of affairs as a serious problem (Baker, 1973; Carey and Briggs, 1977). If one assumes that development is in essence an applied science, this state of affairs certainly poses a problem. If, however, one assumes that development is a complex role which legitimately includes both scientific and intuitive problem-solving, then it is possible to take an alternate view. Our position is that it would be better to develop strategies from our analyses. Unfortunately, intuitive or creative problem-solving will be required until the models of formal analysis are sufficient to deal with the complex reality in which we define problems.

We see theoretical promise in the work of Salomon (1979), Levie and Dickie (1973) and cognitive psychologists such as Klahr (1976) and Scandura (1977). These and other authors have begun to define treatments in terms of the psychological functions they elicit in the learner. Salomon, for example, defines treatments in terms of their potential to cultivate, activate, or supplant specific intellectual functions. Merrill, et al., (1979) and Boutwell (1978) have developed a scientific motivation system which attempts to identify or code the teaching process in an elaboration of the rule-example coding of programmed-instruction literature.

These mechanisms and others like them are certainly not definitive. We expect that a generation or more will be required before strategy-building will proceed from a completely scientific basis.

Given this state of affairs, we often manage our strategy-building activities after the models for fostering creativity (DeBono, 1971; Koberg and Boynall, 1972). Small-group processes such as brainstorming, devices for breaking set, etc., are used. We also invest a great deal of energy and resources seeking comparable solutions to problems. In this type of activity the knowledge gained from formal analysis becomes a preliminary phase in defining the problem. The creative problem-solving processes which follow result in the complete instructional plan. We also find our clients' participation in these activities results in a more complete ownership of the solution by the client system.

Strategies

Social implications do follow from the choice of analysis models. For example, it was noted above that behaviorally-oriented, pre-knowledge systems tend to utilize individually-oriented, linearly-sequenced instruction. Therefore, the social consequences of learner and task analysis tend to be carried out in specifying learning strategies. The art of trading off social and technical consequences of strategies can be practiced in the design of strategies, however. For example, it is possible to envision a mastery oriented pre-knowledge instructional system that is managed by small groups of learners who manage themselves in the choice of materials and experiences designed to enhance their creative skills. This hypothetical hybrid "trades off" the strengths and weaknesses discussed previously. This trade-off may only result from a social and technical analysis.

EVALUATION

Evaluation is **not** the last step in the development process, as one might mistakenly infer from the countless flowcharts depicting development models. Indeed, formative evaluation should happen concurrently with **all** activities in that process. The image of the evaluator is beginning to change as a logical result of this more intensive view of evaluation. No longer only detached, dispassionate observers aloof from the development of an instructional program, evaluators are becoming involved with the program their assessments shape. Evaluators are thus forging increasingly instrumental roles which contribute to a program's definition and implementation (Morris and Fitz-Gibbon, 1978a).

Virtually all functions of the systematic design process we have described can be evaluated. For example, the implementation of a development project's instructional design can be evaluated on three different levels. First, the prototype materials can be judged informally using expert opinion and by observing and collecting information from small groups of typical learners. On the second level, a refined prototype can be implemented on a "pilot" level while formative evaluation data is collected describing its use and effects. Finally, a third level allows for the fully-implemented program to be monitored so as to ensure consistency between intended and actual procedures. The first two of these levels have long been considered part of formative evaluation in instructional development (Baker and Schutz, 1971; Gagne and Briggs, 1974; Markle, 1969). Unfortunately, the third level, critically important in determining a program's success or failure, has too often been neglected despite the existence of an appropriate technology (Morris and Fitz-Gibbon, 1978b).

The evaluation function can itself be assessed. This intriguing possibility, termed "meta" evaluation by Scriven (1972) is becoming increasingly common. Such evaluations of evaluation efforts should be planned to occur simultaneously with a program's evaluation rather than conceived after the fact. Gregory (1974) provides an example of a well-conducted meta-evaluation.

Evaluation contributes to our work in two important ways. It offers us information about the **processes** we use to design, implement, and assess an instructional program. Evaluation can also provide us with estimates of that program's **outcomes.** While assessment of outcomes is a well-established activity, the evaluation of development processes is seldom given the attention it deserves. More effort in this area would likely result in better procedures and in an increased sharing of them among instructional developers.

Recent Developments

The traditional methods of evaluation, be it formative, summative, or confirmative evaluation, derive from achievement testing, psychometry, inferential statistics, and experimental, quasi-experimental, and correlational researh designs. Increasingly, however, there is a movement away from the "if-it-can't-be-measured-it-doesn't-exist" stance that has sometimes characterized those fields. An increasing number of qualitative tools are joining the conventional quantitative measures available to the formative evaluator. Concern for the ecological setting in which evaluation is carried out (Bronfenbrenner, 1976; Cronbach, 1975; Shrock, 1977) has provided a thrust for the development of such new evaluation technologies. Notable among these for its utility to instructional developers and formative evaluators is naturalistic inquiry (Guba and Lincoln, in press).

Concomitantly, the informality that has characterized formative evaluation (Gagne and Briggs, 1974) is gradually giving way to increased rigor, especially in the pilot and implementation stages.

The technology of summative evaluation has also been subject to expansion as new paradigms are explored. The progress of such concepts as transactional evaluation (Rippey, 1973), goal-free evaluation (Scriven, 1973), adversary evaluation (Levine, 1973; Owens, 1973), and a number of metaphors--poetic and musical criticism (Della-Piana, 1979a, 1979b), investigative journalism (Guba, 1979a), and others--should be monitored by instructional developers and formative evaluators, since intention to apply them in the summative evaluation of projects could have important consequences for the development and formative evaluation of these projects.

While the social implications of these advances in technology are interesting and manifold, space prohibits the exploration of more than a few illustrations. A shift from quantitative to qualitative methods and from "objective" to "subjective" instrumentation, for example, means that students in the program whose design is being evaluated are less likely to be subjected to the behavioral objectives-oriented, pencil-and-paper type of testing that has often characterized evaluation in the past. Many evaluators have long suspected that evaluations using the typical instrumentation have often failed to get to the heart of a program. Perhaps, as Guba (1979b) suggests, this movement will see the replacement of pencil-and-paper instruments with instruments that are potentially more comprehensive: human beings.

The increased rigor of the procedures being applied to developmental stages will mean that students should be exposed to more "bug-free" programs, which took less time (and therefore, cost) to develop, than previously.

Finally, the social implications of changes in the technology of summative evaluation are legion, for both the developers and the students. For example, the stoicism of a developer who holds sacred the behavioral objective would be sorely tested by a summative evaluator who plans a goal-free orientation, and says, in effect, "Don't tell me what your objectives are. I don't want to be 'contaminated' by knowing them. I'll just go out there and find out what your program is doing, then you can tell me whether or not that's what you wanted it to do."

SUMMARY

We have argued that questions surrounding the management of the development process have critical importance for the successful practice of instructional development. Additionally, we have identified the formal analysis of learners and tasks, the specification of instructional strategies, and evaluation as important functions within that systematic design process. Finally, we have included brief reviews of developing trends for each of these four functions.

Our view of instructional development deliberately emphasized the social aspects of that systematic design process. Our experience suggests that improvements in relevant social analysis, when combined with competently-applied technical analysis, can result in more accurate predictions of success or failure than can formal analytic or evaluative procedures alone. Consequently, we see the role and definition of instructional development dramatically changing in the next few years. We expect the continuing pursuit of social analysis to change the character of professional practice--our self-concept, our influence and our institutional identity. We have argued that the "developer scientist" has no clothing unless he has an awareness of the social implications of his technical analyses.

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Chapter 6

Metamethodology

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The literature of ID is filled with flow-charts and step-by-step procedures. They are designed to enable the development process to be conducted as a technological procedure, producing identical outcomes no matter who the developer is. As we all know, this is an ideal; the use of these procedures may, at the best, make the design of instruction a technological art, and at worst they may so mislead the artist that the resulting instruction is worse than it would have been without their use. How can such procedures be designed so that the resulting methodologies more clearly approach our ideal? The following chapter presents an answer to this question.

METHODS AND METHODOLOGIES

When two people use the same word they don't necessarily mean the same thing (Hutchinson and Benedict, 1970). This phenomenon, which is used to advantage by poets and novelists, is a problem for scholars. Scholars wish to convey exact meaning. For this reason, scholars often construct new definitions of terms so that the audience will be less likely to misunderstand what they mean when they use those terms again.

The word "methodology," for example, is used in different ways. One can refer to the methodology of a study and mean the particular design of a particular experiment. People say that they study research methodology and mean that they study the tools and techniques that are used in research. For the purposes of this paper the word "methodology" is defined as a systematic, operational, standard set of rules and procedures designed to accomplish an operationally-defined purpose (Hutchinson, 1972). The word "method" is defined as a general set of guidelines for the accomplishment of a task.

Given these definitions, most of the tools that exist in the social sciences are methods. Most of the tools that exist in statistics, a branch of mathematics, are methodologies. In the social sciences we have research methods, teaching methods, evaluation methods, and needs-assessment methods. There are inherent weaknesses in methods. It is possible for two people to follow the same method of needs-assessment in very similar circumstances, but have a very different result in the degree to which the task is accomplished. In general, methods allow for variations in performance which may seriously affect the quality of the result.

Given a certain task, it may be difficult to determine if a particular method is appropriate or not. Some methods have no stated purpose other than what might be implied by the name of the method. For some methods, it is claimed that there are many different purposes which can be accomplished through its use. There are no methods for which the purpose of the method is operationally defined so that a person can be entirely sure of what the method is designed to accomplish.

It is often possible to find several variations of the guidelines for the use of a method. It may be unclear which variation should be used in one particular set of circumstances. When people report their results, it may be unclear which variation of the method was used.

Some methods are in the form of checklists. The person using the method is to do all the steps, but the order in which they are to be done is not specified. The results of using such a method will be highly variable if the order of the steps does make a difference.

The steps of a method are general. It is possible for two people doing the same step under very similar circumstances to select very different activities and perform them in very different ways. The more general and imprecise the steps of a method are, the greater the variation in the resultant performance can be.

A methodology is a more scientific process. It is much more thorough than a method. Methodologies do not have the inherent weaknesses of methods.

A methodology is composed of precise steps at a level of operational detail. There is a specific prescribed sequence in which the steps are to be performed. If any alternative versions of a methodology exist they are carefully named, so that users may know and report exactly what procedures were used. A methodology has an operationally-defined purpose. Everyone may understand the purpose of the methodology in the same way because the purpose is clear and unambiguous.

It is because a methodology is an operational, systematic, standard set of rules and procedures designed to accomplish a defined purpose that a methodology can be scientifically tested. It is because a methodology can be scientifically tested that the development of a methodology can proceed as a scientific process.

When a methodology is implemented for the purpose of testing, because the purpose is operationally defined, the extent to which the purpose has been accomplished can be measured. Because the steps of a methodology are operational, people can know what was done to produce the measured result. Thus people are in a better position to identify where problems may have occurred, to attempt rectification and to test the modifications made. It is expected that repeated testing and redesigning will result in the development of a methodology which will increasingly accomplish its purpose whenever it is applied.

SOME METHODOLOGIES UNDER DEVELOPMENT

There is a developing body of successful work in the area of building methodologies for the social sciences. The development of methodology has occurred and is occurring in both the conclusion-oriented area (basic social science inquiry) and the decision-oriented area (applied social science or social engineering). The methodologies being developed in the decision-oriented area can be placed into three categories: those concerned with needs for information, those concerned with providing educational services, and other methodologies.

There are five methodologies which are primarily concerned with collecting information. The Needs-Analysis Methodology is concerned with pro viding needs-data for decision-making (Coffing et al, 1973; Coffing and Hutchinson, 1974; Thomann, K., 1976; and Brush, 1976). The Client-Demand Methodology is concerned with producing information about client demands (Coffing, 1973). The Participatory Needs-Analysis Methodology for Community Planning is concerned with having a community of people be able to determine and measure their own needs from their own perspective (Aponte, 1978). The Evaluation Methodology is concerned with providing data about an enterprise for decision-making (Benedict, 1973a, 1973b and 1974; Gordon, 1973; Jeffers, 1974; Rosen, 1974; Mitchell, 1975; and Hutchinson, 1976). The Operationalization of Fuzzy Concepts Methodology is concerned with having a person be able to produce an operational definition of a complex vague term (Hutchinson and Benedict, 1970; Coffing, et al, 1971; and Jones, 1971).

There are three methodologies which are primarily concerned with providing educational services. The Instructional Simulation Design Methodology involves procedures to develop simulated experimental techniques for the accomplishment of defined learning objectives (Thomann, J., 1973). The Methodology for Teaching by Inquiry is concerned with a self-directed mode of learning in which the student selects and organizes learning activities for the accomplishment of a goal (Hoagland, 1972). The Methodology to Develop Humanistic Psychological Education Curricula is concerned with how to develop new ways of having learners attain humanistic goals and objectives (Brooks, 1975).

There are three other methodologies that are in the decision-oriented area. The Decision-Making Methodology is concerned with helping a person to make decisions that are optimal with respect to what that person desires (Heffernan, 1976 and Hodson, 1974). The Dissemination Methodology is a methodology for technology transfer and is involved with meeting needs through the dissemination of products (Welsh, 1976). Metamethodology is a process for building a methodology for any definable purpose. (Thomann, J., 1973 and Hutchinson and Thomann, J., 1975).

In the area of conclusion-oriented research there are two methodologies. There is a general Knowledge-Generation Methodology (Hutchinson, 1974 and 1975 and Figueroa de Guevara, 1977). There is also a specialized methodology for the development of knowledge in the area of linguistics (Mehta, 1975).

METAMETHODOLOGY DESCRIBED

There is a methodology for building methodologies, called Metamethodology. The purpose of Metamethodology is to build a methodology for any definable purpose. Metamethodology is composed of systematic, operational, standard set of rules and procedures. These rules and procedures are organized into a small number of major processes. These major processes will be briefly described.

The first major process is the Preparation Process. In the Preparation Process a person learns how to apply Metamethodology and makes plans for the use of the resources that are available for building a methodology.

In the next major process a person chooses a problem-area. For example, needs assessment.

In the next major process the person chooses a purpose for the methodology s/he will build. This is done by studying the problem-area, the tools that now exist in the problem-area, and what purposes the literature of the problem-area state or imply. Some initial testing of the acceptability of the purpose is also done here.

In the fourth major process the chosen purpose is carefully tested for acceptability. Desirability, definability, and practicality of the purpose are considered.

In the next major process the person analyzes the implications of the purpose for the general steps that the methodology should contain. These general steps are then arranged in a rational sequence.

In the next major process the person produces an operational definition of the purpose of the methodology.

In the seventh major process the person produces the detailed operational steps of the methodology. This is done by identifying subpurposes, analysis of the implications of the subpurposes, ordering the implications, and performing tests of logic at several levels.

In the last major process the person performs research on the methodology in order to identify problems and to correct them. This process proceeds from simple to complex tests and may go on for quite a long time.

Version I of Metamethodology is the next section of this paper. The rules and procedures of Metamethodology are documented in a manner similar to that used with a computer program. After the first step is performed, the user drops down to the next, unless the step directs the person to go to some other part of the methodology. There is substantial branching and looping built into the procedures. For these reasons it is very difficult to understand the procedures from a simple sequential reading of the steps and it would be preferable to work through the steps with a sample problem. The Metamethodology is designed to be effective in its entirety. No particular step is expected to be effective for every application.

METAMETHODOLOGY--VERSION I*

I. Prepare to use Metamethodology
    A. Learn how to apply Metamethodology
        1. Take a course on Metamethodology, if a course is available.
        2. Read the following documentation on Metamethodology.
            a. Hutchinson, Thomas E. Metamethodology, Photocopy, University of Massachusetts, 1978.
            b. Thomann, James. Metamethodology: The First Field Test. Unpublished doctoral dissertation, University of Massachusetts, 1973.
            c. Coffing, Richard T. Identification of Client Demand for Public Services: Development of a Methodology. Unpublished doctoral dissertation, University of Massachusetts, 1973.
    B. Decide how to use the available resources
        1. Determine how much of what resources are available to be used in the development of a methodology.
        2. Allocate the actual amount of your time available or 100 hours of your time, whichever is smaller, as suggested in Figure 6-A.
        3. When these allocations are used up, allocate half of the remaining resources as you choose in Figure 6-A.
        4. When these allocations are used up, allocate the remaining resources as you choose in Figure 6-A.
        5. If any resources remain, go to step II.
        6. Get more resources and go to step I.B.3.

II. Choose a problem
    A. The simple method
        1. Make a list of your professional interests on Figure 6-B.
        2. For each interest, make a list of the problems in this area.
        3. Circle the problem that you would most like to do some work to solve.
        4. If you are satisfied with this choice, skip to step III.
    B. The moderate method
        1. On Figure 6-B circle the interest that you would most like to explore.
        2. On Figure 6-C make a list of the published materials that describe the problems in this area.

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*Metamethodology--Version I is a modification of Metamethodology, Draft IX, by Thomas E. Hutchinson and James B. Thomann, Photocopy, October, 1975.

Major Process	First 100 Hours or Less %	First 100 Hours or Less Amount	Second Allocation	Third Allocation
II	5			
III	10			
IV	10			
V	20			
VI	10			
VII	35			
VIII	10			

Figure 6-A. Resource allocation chart.

List of Interests	List of Problems

Figure 6-B. Interests and problems.

List of Materials	List of Problem Statements

Figure 6-C. Materials and problem statements.

3. Read each piece of material and list the problem-statements.
4. Circle the problem-statement that you would most like to do some work to solve.
5. If you are satisfied with this choice, skip to step III.

C. The complex method. Use Coffing's Client-Demand Methodology. (See step I.A.2.C.)

III. State a purpose for your methodology
  A. Analyze the problem-area
    1. On Figure 6-D, enter the problem-area you have chosen.
    2. Make the following lists:
      a. Literature about the problem.
      b. People who have done work on the problem.
      c. Work being done on this problem.
      d. Tools that have been developed to help solve the problem.
    3. Circle those items that you have the time to (read, talk to, go and see, or try out) and which are available.
    4. Do each of these circled activities and whenever you read, hear or think of a purpose-statement that, if accomplished, might solve the problem, write it down on Figure 6-E.
    5. If the problem-area seems to be too large, repeat steps one through four above with a smaller problem-area.
    6. Now circle that one purpose on Figure 6-E which best describes what needs to be accomplished in order to solve the problem.
  B. Test the purpose
    1. Can some unimportant event occur which would satisfy this purpose?
    2. If so, change the purpose and test it again until your purpose is sufficiently demanding.
    3. Imagine that your purpose is being accomplished. Could the problem still exist? If so, change the purpose and test it again.
    4. If resources warrant, show the purpose to others for their critique based upon the above two criteria.
    5. Write out the purpose and commit yourself to it. (If you can say why you don't like it, then revise and recycle to B.1. If you can't say why you don't like it, then go on to Step IV.)

IV. Test the purpose by the following criteria:
  A. Do you know enough?
    1. List the names of three people whom you consider to be experts about your chosen problem.
    2. Does your name belong on this list?
    3. If not, study the problem through activities on Figure 6-D until it is reasonable to add your name to the list; or go back to step II and choose another problem, perhaps a smaller problem.
  B. Is the purpose desirable?
    1. Do you think people concerned with this problem would find your purpose desirable? Why or why not?
    2. If you are not sure of your answer to number one above, ask people who are concerned with the problem if they find your purpose desirable.
    3. If you are not sure of the answer now, check the literature to see if the purpose is desirable.
    4. If you are still not sure of the desirability of the purpose, use Coffing's Client-Demand Methodology (see step I.A.2.c.).
    5. If you have decided that the purpose is sufficiently desirable, proceed;

(name of problem area)

Lists

Literature	
People	
Work Being Done	
Tools Available	

Figure 6-D. Sources of purpose statements.

(name of problem area)

Purpose Statement	Source

Figure 6-E. Purpose statements.

otherwise go back to step III to choose another purpose or to step II to choose another problem.

C. Is the purpose definable?
  1. Imagine a situation in which your methodology is being used. Imagine that your methodology is working and your purpose is being accomplished. What can you see about this situation that indicates to you that your purpose is being accomplished? Write your answer.
  2. If you can't write anything, go back to step III; otherwise continue.
  3. Repeat step III.B in light of the partial definition and revise, if necessary.

D. Is the purpose practical?
  1. Answer the question yourself in terms of:
     a. Is the development of a methodology practical, given this purpose?
     b. Once developed, would the methodology be a practical way to accomplish the purpose?
  2. Get other people to answer questions 1.a. and 1.b. above.
     a. Methodologists answer question C.1.a.
     b. Methodologists and potential users answer question C.1.b.
  3. Revise the purpose if necessary and recycle through A., B. and C.; otherwise continue.

E. Are existing methodologies insufficient?
  1. Review the literature in your area of interest and search for methods and methodologies which exist in the area. List those methods and methodologies on Figure 6-F, Column 1 and the source of each in Column 2. If there are no methods or methodologies in your area, skip to step F.
  2. For each method or methodology listed on Figure 6-F, if it does not consist of a systematic, standard and operational set of procedures with a defined purpose, place an X in Column 3 of Figure 6-F.
  3. Consider further only those methodologies which do not have an X in Column 3. Check each remaining methodology to see if it is designed to accomplish the purpose of your methodology. If it is not designed to accomplish your purpose, place an X in Column 4 of Figure 6-F.
  4. Do not consider further any methodology which has an X in either Column 3 of Column 4. Check each remaining methodology to see if it actually does accomplish your purpose. If it does not accomplish your purpose, place an X in Column 5 of Figure 6-F.
  5. Do not consider further any methodology which has an X in Column 3, Column 4 or Column 5. Check each remaining methodology to see if it is a practical way to accomplish your purpose. If it is not practical, place an X in Column 6 of Figure 6-F.
  6. Do not consider further any methodology which has an X in Columns 3, 4, 5, or 6. Check each remaining meth-

(1) Name of Method or Methodology	(2) Source	(3) Methodology	(4) Designed for Your Purpose	(5) Does It Accomplish Your Purpose	(6) Practical	(7) Desirable	(8) Complete

Figure 6-F.

odology to see if it is a desirable methodology. If it is not desirable, place an X in Column 7 of Figure 6-F.

7. Do not consider further any methodology which has an X in Columns 3, 4, 5, 6, or 7. Check the remaining methodology to see if the methodology is completely developed. If the methodology is completely developed, then there is no need for you to build such a methodology. Go to step II and choose a different problem. If the methodology is not fully developed, you could, if you wish, work on the further development of this methodology rather than build a methodology of your own. If the methodology is not complete, place an X in Column 8 of Figure 6-F.
8. If for each method or methodology on Figure 6-F there is an X in Columns 3, 4, 5, 6, or 7, then it is reasonable for you to build a methodology for your purpose. Otherwise, you should either choose a new problem or possibly work on the further development of a methodology which is not complete.

F. If you are sure that you are prepared to use your valuable time to build a new methodology to accomplish this purpose, then proceed to do so. If for any reason you are not ready to do this, go back to whatever point in metamethodology you wish and reconsider the decisions you made.

V. Analyze the implications of the purpose for the development of methodology. (This is a way of identifying the attributes that the methodology must have.)

A. Use the following method to analyze the implications of the purpose. (The implications of the purpose supply the first approximation of the major elements of the methodology.)
   1. On Figure 6-G, write down in what ways you could fail to accomplish your purpose.
   2. On Figure 6-G, write down in what ways you can accomplish your purpose, avoiding all the problems.
   3. Imagine a situation in which your purpose is being accomplished. Write down what is being done to accomplish the purpose on Figure 6-G.
   4. If an experienced methodologist is available, ask her or him to do steps one through three above on your purpose. Otherwise, ask someone who is available and who would be most knowledgeable about the problem-area.
   5. Consider the ideas you get from others in step 4 above and add to Figure 6-G further ways to accomplish your purpose.

B. Choose the initial set of major processes for the methodology.
   1. Cross off the list of elements on Figure 6-G--Ways to Accomplish--all of those elements that you decide it is not necessary to accomplish.
   2. Where two items or more are similar and only one is needed, cross off those you will not need.
   3. Write the items that have not been eliminated on Figure 6-H under the heading, Selected Ways to Accomplish the Purpose.

C. Organize the attributes into a rational order of steps.
   1. On the list of Selected Ways to Accomplish the Purpose on Figure 6-H, which one would have to be accomplished first in order to accomplish the rest? Write it down as number one (1) under the heading, Ordered Ways to Accomplish the Purpose.
   2. If this first element were actually accomplished, which one of the remaining elements above would now have to be accomplished in order to accomplish the rest? Write it down as number two (2).
   3. If these first two elements were actually accomplished, which one of the remaining elements would be next? Write it down as number three (3).
   4. Continue this process until you have put all the items into order.
   5. Check over the ordered ways of accomplishing the purpose on Figure 6-H. Is this order logical?
   6. Make any changes that are necessary.
   7. For each item on Ordered Ways of Accomplishing the Purpose on figure H, check to see if the item is stated procedurally. For example, if a step reads "objectives," it is not stated procedurally.
   8. If an element is not stated procedurally, rewrite it so that it is.
   9. These elements are now the major processes of your methodology.
   10. Rewrite these major processes on Figure 6-I next to the appropriate number.

D. Test the completeness of the major processes.
   1. Look at step 1 on Figure 6-I and ask yourself if anything has to be done before this step in order to accomplish the purpose. Consider the following possibilities: Do you need to obtain resources in order to do the methodology? If someone else were

using your methodology, would s/he need to learn how to use it first? Would you need to plan the application of the methodology in terms of resources or time?

  2. If so, write them down next to A., B. and C. on Figure 6-I.
  3. Look at the last numbered step on Figure 6-I and ask yourself if anything has to be done after this step in order to accomplish the purpose. Consider the following possibilities: Do you need to evaluate the success of the application of your methodology? Do you need to plan to go back to some point in your methodology if there has been some lack of success?
  4. If so, write them down next to X., Y. and Z. on Figure 6-I.
  5. Show Figure 6-I to an experienced methodologist and ask her/him to critique it and make suggestions.
  6. Consider the comments and suggestions and make whatever changes you decide are appropriate.

E. Complete the first draft of your methodology.
  1. Choose a name for your methodology and write it in Box 1 of Figure 6-J.
  2. Put your name in Box 2 and the date in Box 3.
  3. Write your purpose in Box 4.
  4. Rewrite the steps of your methodology next to the appropriate Roman numerals.

VI. Operationalize the purpose of your methodology.
  A. The straight analysis technique.
    1. List the unoperational words or phrases in your purpose.
    2. Ask someone experienced in developing methodologies to list the unoperational words and phrases in your purpose.
    3. Modify your list, if necessary.
    4. Think of the best operational word or phrase that you could substitute for the first unoperational word or phrase on your list.
    5. Does the operational word or phrase mean essentially the same thing to you as the unoperational word or phrase?
    6. If not, proceed to step 8; otherwise continue.
    7. Repeat steps four through six on the next unoperational word or phrase of your purpose. When you have defined all the terms in your purpose, go to step 13.
    8. Think of several (two to ten) operational words or phrases that, as a set, would best define the fuzzy word or phrase of your purpose and write them down.
    9. Do the operational words or phrases mean essentially the same thing to you as the unoperational word or phrase of your purpose?
    10. If you answered "no," proceed to step B; otherwise continue.

Purpose:	
Ways to Fail:	Ways to Accomplish:

Figure 6-G.

Selected Ways to Accomplish the Purpose
Ordered Ways to Accomplish the Purpose

Figure 6-H.

11. If you answered "yes," and you have now defined all the terms in your purpose, go to step 13.
12. Go to step 7.
13. Write out your purpose and its operational definition in Figure 6-K.
14. Examine your purpose and definition. Do the operational words or phrases of your definition, as a set, completely define your purpose?
15. If not, modify your definition until the operational definition is satisfactory to you.
16. If you are still not satisfied, go to step B; otherwise continue.
17. Ask someone experienced in developing methodologies to critique the definition of your purpose.
18. Modify your definition, if necessary.
19. If you are not satisfied with the definition you have produced, then go to step B; otherwise go to step VII.

B. Other ways of defining the purpose.
   1. Should any of the unoperational words or phrases of our purpose be defined when your methodology is applied? One possible reason for your dissatisfaction with the definition you produced is that possibly one or more of the unoperational words

Purpose:

A.
B.
C.

1.
2.
3.
4.
5.
6.
7.
8.
9.
10.
11.
12.
13.

X.
Y.
Z.

Figure 6-1.

or phrases should only be operationally defined when your methodology is implemented in a particular situation. In that case, you should provide a process in your methodology for the defining to occur at the appropriate time, and to be done by the appropriate person or persons.

2. If your answer to the question above is yes, then skip to step 10.
3. Imagine a situation in which your methodology might be used. Now imagine that your purpose was successfully accomplished. What can you see about this situation now that indicates that your purpose has been

accomplished? Write them down.

4. Perhaps your purpose is too complex for one methodology to accomplish. If you wish, you may choose one part of the purpose and go back to step III; otherwise continue.
5. Given your response to step 3, list the operational words and phrases.
6. Given your response to step 3, list the unoperational words and phrases.
7. For each of the unoperational words and phrases, imagine that it has been accomplished when your methodology was applied. List everything that you can see that indicates to you that this word or phrase has been accomplished.
8. Perhaps your purpose is too complex for one methodology to accomplish. If you wish, you may choose some

Name of Methodology: 1.	DRAFT I
Your Name: 2.	Date: 3.
Purpose: 4.	
I. II. III. IV. V. VI. VII. VIII. IX. X. XI. XII.	

Figure 6-3.

part of the original purpose and go back to step III; otherwise continue to work on defining your purpose until you have it defined completely in operational terms.

9. When your purpose is completely defined, go to step VII.
10. There are several ways to have a person operationally define a word or phrase. Some of these ways are simple, but only work if the person has a simple meaning for the word or phrase. An approach that has been used quite often is to have the person try the easiest way first. If the easiest way doesn't work, then try the next harder but more powerful method, and so on.

    The simplest method of operationally defining a word or phrase is to substitute one operational word or phrase for the fuzzy word or phrase. The next harder method is to substitute a few operational words or phrases for the fuzzy word or phrase. These two methods are illustrated in step VI, A.

    If these methods don't work, then a more thorough method of operationally defining is needed. Step VI, B, 3 through 8, illustratates a more complex process.
11. Given your major processes in Figure 6-J, decide if the defining should be done in one of these major processes or whether there needs to be a new major process in which the necessary defining would be done.
12. If there needs to be a new major process, then add that major process to the list in Figure 6-J; otherwise indicate by an asterisk in which major process the defining will be done.

VII. Design the detailed steps of the methodology.

- A. Plan the sequence of the work to be done.
    1. Look at the first major process of your methodology in Figure 6-J. Is it clear to you how you would go about doing that major process? If it is fairly obvious how that major process would be done, place a check-mark to the left of that major process.
    2. Review each of the major processes in order and place checkmarks to the left of those where it is reasonably clear to you how to accomplish that major process.
    3. Of those major processes which do not have a checkmark, choose the one which is the most crucial to the accomplishment of the purpose of your methodology.
- B. Design the major steps.
    1. Write the word "To" in front of the first word in your major process.
    2. Is the result an adequate statement of the purpose of the major process? If not, what would be a good statement of the purpose of the major process?
    3. Write the purpose of the major process in Figure 6-L.
    4. In Figure 6-L, write down in what

Purpose:

Operational Words or phrases:

Figure 6-K.

ways you can accomplish your purpose.

5. In Figure 6-L, write down in what ways you can accomplish your purpose, avoiding all the problems.
6. Imagine a situation in which your purpose is being accomplished. Write down what is being done to accomplish the purpose, in Figure 6-L.
7. Have an experienced methodologist using your purpose do steps four through six.
8. Cross off the list of steps in Figure 6-L, Ways to Accomplish, those steps you decide are not necessary.
9. Where two or more items are similar and only one is needed, cross off those you will not need.
10. Write, in Figure 6-M under the heading, Selected Ways to Accomplish the Purpose, those items in Figure 6-L which have not yet been eliminated.

C. Order the major steps.
   1. Of the list of Selected Ways to Accomplish the Purpose, in Figure 6-M, which one would have to be accomplished first in order to accomplish the rest? Write it down as number one (1) under the heading, Ordered Ways to Accomplish the Purpose.
   2. If this first step were actually accomplished, which one of the remaining steps above would now have to be accomplished in order to accomplish the rest? Write it down as number two (2).
   3. If these first two steps were actually accomplished, which one of the remaining steps would be next? Write it down as number three (3).
   4. Continue this process until you have put all the items in order.
   5. Check the ordered ways of accomplishing the purpose in Figure 6-M. Is this order logical?
   6. Make any changes that are necessary.
   7. For each item in Ordered Ways of Accomplishing the Purpose in Figure 6-M, check to see if the item is stated procedurally.
   8. If a step is not stated procedurally, rewrite it so that it is.
   9. These steps are now the major steps of your major process.
   10. Rewrite these major steps in Figure 6-N next to the appropriate number.

D. Test the completeness of the major steps.
   1. Look at step 1 in Figure 6-N and ask yourself if anything has to be done before this step in order to accomplish the purpose.
   2. If so, write them down next to A., B. and C. in Figure 6-N.
   3. Look at the last numbered step in Figure 6-N and ask yourself if anything has to be done after this step in order to accomplish the purpose.
   4. If so, write them down next to X., Y. and Z. in Figure 6-N.
   5. Show Figure 6-N to an experienced methodologist and ask her/him to critique it and make suggestions.
   6. Consider the comments and sugges-

Purpose:	
Ways to Fail	Ways to Accomplish

Figure 6-L.

tions and make whatever changes you decide are appropriate.

7. Look at the purpose of your methodology in Figure 6-J.
8. Look at the first major step of your major process in Figure 6-N.
9. Ask yourself, "If I did this step, would this prevent or hinder the accomplishment of the purpose of the methodology?"
10. If the answer is yes, modify this step or the whole major process if necessary, and then try steps seven through ten again.
11. If the answer is no, then repeat this exercise with the next major step until you have done them all.
12. Rewrite the major steps of your major process, in Figure 6-O.

E. Design the major steps for each major process.
   1. Make a set of worksheets like Figures 6-L through 6-O.
   2. Go to step VII, A, 3. and build the major steps for the next major process.
   3. Continue this process until you have identified the major steps of each major process.
   4. Put the Figure 6-O for each Major

Selected Ways to Accomplish the Purpose
Ordered Ways to Accomplish the Purpose

Figure 6–M.

Process in order and staple all of them together. This is Draft II of your methodology.

VIII. Test and then revise the purpose and/or procedures if necessary.

A. Determine if you are ready to field-test your methodology.
   1. Look at the major steps of Draft II of your methodology.
   2. Would it be possible for you to try to

Major Process:

Purpose:

A.

B.

C.

1.

2.

3.

4.

5.

6.

7.

8.

9.

10.

11.

12.

13.

X.

Y.

Z.

Figure 6-N.

carry out these steps in a simple situation?
   3. If the answer is yes, skip to step VIII, D; otherwise go to step VIII, B.
B. Perform a test of the logic and completeness of your methodology.
   1. Look at the first two steps of your methodology.
   2. Imagine that the first step is done.
   3. Should anything else be done before the second step is done?
   4. If the answer is "yes," then there is a break in continuity between these two steps. Put a capital B̲ in the space between the two steps.
   5. If the answer is "no," then there is no break in continuity between these two steps.
   6. Look at steps two and three of your methodology.
   7. Imagine that step two is done.
   8. Should anything else be done before

Name of Methodology:

DRAFT II

Name of Major Process:

Your Name:

Date:

Purpose:

A.
B.
C.
D.
E.
F.
G.
H.
I.
J.
K.
L.

Figure 6-O.

the third step is done?

9. If the answer is "yes," then there is a break in continuity between the two steps. Put a capital B̲ in the space between these two steps.
10. Continue this process until you have tested each pair of steps in your methodology.
11. Look at the first step of your methodology.
12. Imagine that you are trying to explain to someone else how to do this step.
13. If much explanation is needed, then the step is very unoperational. Put a capital F̲ (for Fuzzy) to the left of the step.
14. If little or no explanation is needed, then the step does not need any work on it at the moment.
15. Repeat this process with each step of your methodology.

C. Make improvements in your methodology.
   1. Look at the first B̲ or F̲ on Draft II of your methodology.
   2. Is it clear to you how you would solve the problem?
   3. If the answer is "no," then use the procedure for step VII to help you either to design the steps of the fuzzy (F) major step or to figure out what major step is missing which causes the break (B) in continuity.
   4. If the answer is "yes," then look at the next B̲ of F̲ and repeat this process until you either are ready to do a field test (step VIII, D.) or until you have designed solutions for all of your B's and F's.
   5. When you have completed the design of solutions for all of the problems identified, design a field-test for your methodology. This process begins in the next step below.

D. Field test the methodology.
   1. The first field-test should be done upon the whole methodology under the simplest possible conditions.
      a. In Figure 6-P, write the name of your methodology and the purpose.
      b. Do an analysis of the simplest possible conditions for your methodology in Figure 6-P.
      c. Make a list of possible places to field-test your methodology.
      d. For each of these possible places, see how close it comes to your conditions for a simplest possible field-test.
      e. Take the situation that comes closest to your requirements and see if you will be permitted to do your field-test.
      f. If not, try the next-closest place until you can do your field-test. If necessary, go back to step e. above.
      g. Make a set of forms like Figure 6-Q.
      h. In the first column, write the step number or letter of the first step of your methodology.
      i. Perform the step and enter in the second column what you actually did. Tape record conversations with people, if they don't mind. Save anything that is written down.
      j. Compare what you did with the step in the methodology. If there are any differences, record the differences in column three. In a first field-test, what you actually did may be more operational than the description of that action in the written step.
      k. Enter the results of doing the step in the fourth column. Reference the tape or documents, if any.
      l. If anything has gone wrong or not worked as well as you would like, describe the problem in column five.
      m. Draw a line across the worksheet at the bottom of these entries for step one of your methodology.
      n. Repeat this process for the next step of your methodology and continue until the application of the methodology is completed.
   2. Make improvements in your methodology.
      a. Look at the first problem you encountered when you field-tested your methodology.
      b. Is it clear to you how you would solve the problem?
      c. If the answer is "no," then use the procedures in step VII to help you decide what needs to be changed and to build the new steps for your methodology.
      d. If the answer is "yes," then look at the next problem that you encountered in doing your field-test and repeat this process until you have designed solutions for all of the problems.
      e. Write out a new draft of your Methodology, Draft III.
   3. Succeeding field-tests should be only slightly more complex than those previously conducted.
      a. Review all previously conducted field-tests; if very complex field-tests have found no problems in

any parts of the methodology, go to step VIII, E.

b. Determine what is to be field-tested--a part of the methodology or the entire methodology.

c. Conceptualize a set of conditions a little more complex than the previous field-test on the parts of the methodology to be tested.

d. Find a situation in which the methodology could be applied which is as close as possible to the specified conditions.

e. Write out the purpose (of the methodology or the part to be tested) and its operationalization.

f. Determine your goals for the field-test.

g. Develop the measures for the field-test from the operationalization of the purpose and from your goals.

h. Carry out the field-test, keeping a log as shown in Figure 6-Q.

i. Carry out the measurements.

j. use the data to revise the methodology or the part by using step VII.

E. Do conclusion-oriented research on the methodology. Consider using the Knowledge-Generation Methodology by Hutchinson (1974).

Figure 6-P.

Methodology:

Purpose:

What would be the simplest possible conditions for an application of your methodology?

Figure 6-Q.

Step Done	What Actually Done	If Different From Step, Why?	Results	Problems Encountered

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B. PRACTICAL APPROACHES

Chapter 7

A Matter of Survival

Robert M. Diamond

What determines whether or not an instructional development center will survive budget cuts and administration scrutiny? How can such a center guarantee its effectiveness in the eyes of those who will judge it? The following chapter addresses these questions, and provides an instrument for use in assessing survivability directly.

The years ahead will not be easy ones for colleges and universities. Inflation will continue, and energy and legal costs will continue to consume a large proportion of total operational budgets. For many there will be a decline in overall enrollment. As a result, support agencies such as instructional development centers will find themselves constantly fighting for their share of scarce resources and, in some instances, for survival.

Offices of this type are particularly vulnerable in times of fiscal stress for several reasons. First, they are not a traditional part of "the university"; they do not have the historical base associated with the various academic departments, the library and the computing center. Second, since units may not have direct contact with the total academic community, they are often not perceived by the faculty and by administrators as vital to the institution and its survival; and, third, as easily-identified units with discreet budgets, they are extremely accessible to a budget committee's axe, or an administrator's "trade-off." It is not surprising that many agency heads tend to wish that other units could receive the same attention and evaluation on a yearly basis that their centers attract.

SHOULD INSTRUCTIONAL DEVELOPMENT CENTERS SURVIVE?

Yes....but. A center should survive if it is having a significant and positive impact upon the institution. If the work of the agency helps improve instruction, if its efforts have a direct and positive effect upon attrition and admissions, if the unit helps the college or university make more effective use of its resources...then the agency is crucial to that institution and should be maintained and, perhaps, even expanded. If, however, its impact is minimal and its worth to the institution is in doubt, the unit should not and most likely will not survive. The time is rapidly coming when colleges and universities will no longer be able to maintain inefficient and non-contributing centers and departments. A growing number of institutions have already cut academic programs, closed out areas of specialization, released tenured faculty, and, in some instances, eliminated degree programs.

Instructional development centers will not survive without fighting for their program. The staff of these agencies can no longer assume that because they represent "truth" and "right" their existence is guaranteed. Unless a center builds and works systematically for its survival, its future may be far shorter than its staff might anticipate. Sooner or later every campus is going to take a hard look at how each penny is spent. And, when that day comes, if it hasn't already, the instructional development agency must be prepared.

PREPARING FOR THE INEVITABLE

An instructional development unit can implement a series of actions that will help it survive hard fiscal scrutiny. Some actions are directed at improving its impact and operational effectiveness, while others are more political in nature. Both areas are, however, extremely important. The following recommendations are based upon observations, direct experience, and conversations with administrators, faculty members, and instructional development practitioners.

I. The Unit Must Become An Integral Part of the Institution

This is done in many ways. It means having staff of the agency serve as regular members of key academic and administrative committees. It means obtaining, if at all possible, academic appointments for professional staff members and having them viewed by other faculty members as effective teachers. (At the same time, it is important **not** to let these individuals become so busy with teaching, advising, and adacemic departmental work that their prime functions in development and evaluation suffer.) It is a major responsibility of the director of the agency to facilitate these types of appointments. They rarely occur unless they are actively sought.

For the center to be perceived as important, it requires selecting projects that are important to the individual departments and to the institution. It means becoming a resource to faculty members as they develop grant proposals, particularly those related to course and curriculum development or that include evaluation components. In short, it requires getting involved, being supportive, becoming utilized, and getting known. Each of these steps helps the agency to become recognized as an **integral** part of the institution.

II. The Unit Must Be Productive

While an attempt must be made to never turn down a faculty member or department seeking help, major resources must be spent in those areas in which impact can be the greatest. There is little doubt that supporting a wide range of small projects (single lesson redesigns, media production) can make quite a few friends for the unit. While activities of this type may be undertaken to open doors and lead to more significant projects, this approach alone rarely has major impact upon the course itself, the instructor, or, most important, the student. For agency survival, emphasis must be placed upon designing and evaluating whole courses or curricula, particularly in those areas where either problems exist or enrollment increases are anticipated.

The unit must also be seen as effective and as having a successful track record. If support for a project does not exist within the key departments, if quality faculty members are not willing to become involved, if key administrators do not feel that the project is important...don't get involved. There is too much to lose, and the chances of success are far too small. One faculty member on the "bandwagon" can often do more harm than good, particularly if, as is often the case, the individual is not respected by her or his peers. In addition, if the course or program is tied to a single individual, it is totally vulnerable should that person leave, be promoted, or be given another assignment. For this reason alone, an effort should be made to involve faculty teams in developmental projects.

III. Establish Credibility for What You Do

This process requires several steps. First, a procedure must be established to identify what criteria the various publics you serve will use to measure the success of the project and the agency as a whole (Note 1). It must be remembered that different groups (administrators, the faculty, students) will be looking for different things in a project, and the agency must be sensitive to these variations. An adminsitrator, for example, may be particularly interested in impact upon registration or attrition, while the department will be looking at how the new program is perceived by the faculty members and graduate students involved in its teaching. Second, an evaluation scheme must be built into every project. The evaluation process must be designed to serve two purposes: to provide data essential to the design, implementation, and revision process and to generate data that can be used effectively, if appropriate, for dissemination purposes. Finally, the results of the project should be reported to those who are involved and those who need to know what happened. Effective communication is a key element to agency survival, and all too often it has been left to chance. By knowing what criteria an individual will use to judge the success of a project and her/his decision-making style, you know what type of data to report. There have been many examples in which a center spent its time in those activities that were unimportant in the eyes of both the faculty and the administrators. It is no wonder that many of these units are no longer in operation. It is vitally important that key administrators and academic committees on a campus are involved in setting the operational goals of the agency and are included in the dissemination procedures. This reporting may be informal at times, through meetings and casual conversation. It may also include formal reports and documents. But it must take place. However, this does not happen by chance.

IV. What You Do, Do Well

While the need for a quality product is obvious, it is unfortunate that this is not always the result. This requires not only the careful selection of staff and of projects, (Note 2) but also a concern with quality within every phase of the project. This can be helped by the following:

(a) Build in a content check. Use, if the key content specialist(s) will agree, expertise in the field to review the design of the course and program as it evolves and the content of the materials as they are being produced.

(b) Take care of how the products look. First impressions do count. Neat and well-done graphics, quality typing, and good proofreading are essential. No matter how good the content is, if the reports look messy, if the materials give the appearance of "quick and dirty" production, their effectiveness will be diminished. It is better to produce simple materials that work and have a quality look to them than to generate expensive and complex products that are poorly produced and instructionally questionable.

(c) Build in evaluation from the beginning. Plan to answer the questions that will be asked, collect the necessary base data (Note 3) and make sure that all reports that will be produced can be understood by their intended audiences. Avoid jargon.

(d) Develop a reputation for support, friendliness, and professionalism. How the center looks (its space, layout and design, how people are greeted when they arrive, how efficient it is in day-to-day activities) goes a long way in helping develop a positive image. How phones are answered, how conscientiously deadlines are met, and the overall atmosphere of the offices are all contributing factors.

(e) Don't work in isolation: learn from other institutions, find out what other agencies are doing, what is working and what isn't. Make it your business to separate what is said and reported from what may exist. When you can use effective units or successful techniques that were developed elsewhere, do so. It saves time and money. Keep your professional staff active in national and regional associations...for many, these conferences, workshops, and consultancies serve as their "in-service" training programs. Facilitate and reward professional growth.

(f) Select your faculty with care. Whenever possible, work with faculty members who have the content expertise you need, the respect of their peers, and who "give a damn" about teaching and instruction. You not only are known by the company you keep, **but,** unless you work with top quality faculty members or content experts, you cannot have top quality products.

A FINAL WORD

In the long run, the survival of an instructional development agency will depend upon what is done, how well it is done, and how important these activities are perceived to be **for** the instruction and **to** the faculty, the students and key administrators. Unfortunately, it is somewhat idealistic to always expect that all decisions will be rational and based upon a comprehensive study of facts and priorities. Logic will not always prevail, and, along the way, some very poor decisions can be expected. With careful planning, however, the chance of this occurring can be dramatically reduced. We can plan for survival.

APPENDIX

Guidelines For the Administration, Analysis, and Interpretation of the Planning for the Evaluation of Programs and Agencies Questionnaire (PEPA).

by
Robert M. Diamond
and
Edward F. Kelly

The Planning for the Evaluation of Programs and Agencies questionnaire (PEPA) is designed as part of a systematic process to assist those involved with the administration of academic agencies or departments in selecting the criteria by which the success of that unit will be judged. The recommended procedure for use of PEPA requires that all major groups and individual decision-makers who have responsibilities within or for a specific agency or unit actually participate in the evaluation process. Ideally, the criteria that are established should be agreed to and understood by all.

1. The specific unit or department upon which PEPA is to be focused must be clearly understood by all participants. To avoid confusion, it might help to circle in red in the left-hand column of question #5 the specific unit involved (i.e., faculty development, media services, etc.) or to write the name or department under **Other.** You may also wish to have participants skip questions 1

(Note: Permission is hereby granted for the duplication and use of the Planning for the Evaluation of Program and Agencies questionnaire on college and university campuses.)

through 4 as long as you provide us with this data when you forward the completed set of questionnaires to use for additional analysis.

2. The questionnaire should, depending upon the function and organization of the unit, be completed independently by:

a. The administrator to whom such a program or unit reports.

(If several units are involved in this discussion and they report to the same administrator, the administrator must complete a separate instrument for each unit.)

b. The director or chairperson of the unit.
c. Staff members of the unit.
d. Advisory, Budget or other committees actively involved in unit-related decisions.
e. Individuals directly served by the unit.
f. Funding agency contact - if supported by outside funds.

3. When several groups are involved (committees, staff, etc.) data should be tabulated separately for each group and, if possible, an attempt should be made through discussion to reach preliminary consensus upon priority criteria, both those now in use and others that are desired.

Assuming that time constraints will permit little more than simple tabulation of the frequencies of response to each item and a summary of the number of times particular items were nominated as one of the top five, achieving even a preliminary concensus will be no simple task. Furthermore, PEPA is not composed of 54 independent items. There is some redundancy, and some of the items bear a very close relationship to each other. Consequently, examination of the results may require that additional items and categories be composed that appear to the user group to have face validity and represent criteria as defined in local circumstances.

The two pilot tryouts of PEPA have each shown that users tend to compose their own "new" or additional items in the comments areas. These items are frequently seen as very important by the author. A list of these "new" or additional items should be composed by the facilitator and reported both to the user group and to Syracuse.

4. A meeting should be held to attempt a final consensus upon priority criteria. In attendance should be the administrator to whom the unit reports, the head of the unit, and other appropriate representatives. The facilitator should, using handouts and an overhead projector, first report the summarized data from the various groups and then identify apparent areas of agreement and disagreement. An attempt should be made at this meeting to identify those criteria that will be used and their relative importance.

At this level of use, the identification of "areas of agreement and disagreement" within and between groups on PEPA is based simply upon the **interocular trauma test**; if the result jumps off the summary sheet and hits you between the eyes it's probably worth discussing with the group.

In analyzing the data, you'll notice that the items fall into four general categories: Items 1 through 14, faculty variables; 15 through 25, student variables; 26 through 42, agency variables; and 43 through 54, institutional variables. As soon as a sufficiently large data-base has been developed for PEPA, the factor-analytic composition of the instrument will be examined and appropriate item and scale analyses will be conducted. At that time, we hope to be able to reformat the instrument for machine scoring and thus automate the tabulation and summarization of group responses through a set of simple graphic arrays and descriptive summaries that will identify items and clusters which show either consensus or discrepancy. However, at this time we are far from that level of analysis and reporting. Consequently, users should understand that the instrument is, itself, under development, and that we are eager to receive feedback concerning its strengths and weaknesses.

5. Ultimately, the final criteria that are identified should be published and distributed to all those involved in the decision-making process, for later reference. In addition, attempts should be made to determine how the various criteria can be measured and reported, and a procedure for implementing the evaluation should be adopted.

It is important to stress that, while the procedure will (a) help people identify those criteria which should be used to determine unit success and (b) provide guidelines for determining the effectiveness of a unit in meeting the goals for which it has been established, PEPA, will **not** answer questions about the comparative worth of **different** units. For this decision to be made, judgments are necessary on the comparative value of each of the criteria as they relate to the overall functioning of the institution. While this instrument may provide some data to assist in this deliberation, PEPA is not designed to answer broad questions regarding institutional-wide budget-making when (1) many of the units being evaluated are successfully meeting the charge for which they were established and (2) budget reductions are still deemed necessary.

When the process is completed, we would appreciate your sending the original questionnaires and a summary for each agency to: Dr. Robert M. Diamond, Center for Instructional Development, 115 College Place, Syracuse, New York 13210.

PLANNING FOR THE EVALUATION OF PROGRAMS AND AGENCIES

Robert M. Diamond and Edward F. Kelly

This questionnaire has been designed to help people who are involved in education focus their thinking about the criteria that are currently employed and others that possibly should be employed during an evaluation of programs and agencies. In order to focus discussion, comparison, and summary, you are asked to: (1) provide some background information, (2) indicate criteria you believe are currently being used to evaluate the program or agency in question, and (3) indicate criteria you believe should be used for this purpose.

I. Institutional Data (if appropriate)

1. Size of Student Body:
( ) under 500
( ) 501 - 1000
( ) 1001 - 2500
( ) 2501 - 5000
( ) 5001 - 10,000
( ) Above 10,000

2. Type: A. ( ) Private ( ) Public
3. Structure: B. ( ) K-12 ( ) 4 year college
( ) Junior/community college ( ) Consortial/Regional Responsibility
( ) University

4. Location: State or Province: ____________________
5. Your Role: Place a check-mark in the cell that best suggests what your role is:

Your Role

Faculty Development (In-Service Training					
Course or Curriculum Development					
Media Services					
Library Services					
Library & Media Services					
Computer Services					
Other					
	I am an adminiatrator to whom such a program or agency reports	I am a director of such a program or agency	I am a staff member of such a program or agency	I am a teacher, a member of a committee or an administrator who receives such services	Other

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Go to next page.

II. Listed below are a set of criteria or statements describing characteristics of possible worth. Read each statement carefully and then decide whether or not the characteristic is currently being used to evaluate the specific agency that you are focusing upon in this questionnaire. If you are reasonably sure that a particular criterion is currently in use circle Ⓤ , Used, in the first column. If you are reasonably sure that a characteristic is not in use, circle NU , Not Used, in the first column. If you have absolurtely no opinion on the matter, omit any response.

Whether or not you believe a particular criterion is in current use, use the second set of columns to indicate whether you believe it should be used by circling Yes Ⓨ or No Ⓝ .

		In Use		Should Be Used	
		Used	Not Used	Yes	No
1.	Improvement in the design of academic program.	U	NU	Y	N
2.	Improvement in faculty ability to design and implement an instructional change.	U	NU	Y	N
3.	Faculty support of the program or agency.	U	NU	Y	N
4.	Positive impact upon faculty morale	U	NU	Y	N
5.	Improved faculty/student relationships	U	NU	Y	N
6.	Increased faculty interest and involvement in change	U	NU	Y	N
7.	Breadth of faculty involved in effort	U	NU	Y	N
8.	Faculty job satisfaction and sense of personal meaningfulness	U	NU	Y	N
9.	Impact upon tenure and promotion policies and procedures	U	NU	Y	N
10.	Effectiveness of in-service training programs conducted	U	NU	Y	N
11.	Increasing frequency of faculty conversations about teaching and learning	U	NU	Y	N
12.	Improves faculty teaching through a systematic process using development and evaluation	U	NU	Y	N
13.	Faculty show a sense of ownership in agency or program	U	NU	Y	N
14.	Agency has helped people become better teachers	U	NU	Y	N

Go to next page.

Feel free to make suggestions on additional criteria or your comments in the space that follows.

		In Use		Should Be Used	
		Used	Not Used	Yes	No
15.	Positive impact upon student learning	U	NU	Y	N
16.	Positive impact upon retention-of-learning rate	U	NU	Y	N
17.	Reduction in student attrition rate	U	NU	Y	N
18.	Improved student attitudes toward course, content, and/or program	U	NU	Y	N
19.	Increased student support of agency or program	U	NU	Y	N
20.	Extent of student involvement in agency or program's efforts	U	NU	Y	N
21.	Increased student enthusiasm for learning	U	NU	Y	N
22.	Success of graduates	U	NU	Y	N
23.	Involves students directly in the activities of designing or redesigning courses and programs	U	NU	Y	N
24.	Improves students' peer relationships	U	NU	Y	N
25.	Increases the frequency of informal interaction between students and faculty	U	NU	Y	N

Feel free to make suggestions on additional criteria or your comments in the space that follows.

26.	Quality of materials produced	U	NU	Y	N
27.	Quality of staff	U	NU	Y	N
28.	Accessibility of staff	U	NU	Y	N
29.	Extent to which the agency has helped faculty identify new roles	U	NU	Y	N

Go to next page.

		In Use		Should Be Used	
		Used	Not Used	Yes	No
30.	Excellence of the national reputation of agency or program	U	NU	Y	N
31.	Frequency of projects or efforts initiated	U	NU	Y	N
32.	Variety of strategies and techniques used	U	NU	Y	N
33.	Evaluation of agency or service by an external group	U	NU	Y	N
34.	Credibility in the off-campus local community	U	NU	Y	N
35.	Sensitivity to the political climate of the institution	U	NU	Y	N
36.	Key agency staff are recognized as good teachers	U	NU	Y	N
37.	Staff are administratively well organized	U	NU	Y	N
38.	Staff have a recognized disciplinary background	U	NU	Y	N
39.	Agency produces reports that are attractive and highly readable	U	NU	Y	N
40.	Agency provides dependable and complete services	U	NU	Y	N
41.	Extent to which the reputation of the agency is tied to a specific person	U	NU	Y	N
42.	Program or agency is cost-efficient	U	NU	Y	N

Feel free to make suggestions on additional criteria or your comments in the space that follows.

43.	Direct costs of running program or agency	U	NU	Y	N
44.	Quality of courses or programs developed	U	NU	Y	N
45.	Match between programs developed and institutional priorities	U U	NU NU	Y Y	N N
46.	Extent of research conducted and reported	U	NU	Y	N

Go to next page.

	In Use		Should Be Used	
	Used	Not Used	Yes	No
47. Cost-benefit of agency or program	U	NU	Y	N
48. Effective as a networking device to identify and link resources and people	U	NU	Y	N
49. Effectiveness of the administrative interventions conducted by agency	U	NU	Y	N
50. Produces an increased concern for professional excellence in teachers and administrators	U	NU	Y	N
51. Produces creative and effective products for national use	U	NU	Y	N
52. Sensitivity to the needs and expectations of the state and federal governments	U	NU	Y	N
53. Secures external funding for institutional projects	U	NU	Y	N
54. Improves faculty/administrator relationships	U	NU	Y	N

Feel free to make suggestions on additional criteria or your comments in the space that follows.

Given the criteria rated above, choose the five (5) that you believe are most critical for determining the worth of your agency or program and write their corresponding numbers in the five spaces below. You are not required to rank these five criteria.

__________ __________ __________ __________ __________

NOTES

[1] A protocol that a support unit can use to identify what criteria are being used to measure its success on its own campus will be found on pages

[2] A comprehensive discussion on project generation and selection will be found on pages 27-37, Instructional Development for Individualized Learning in Higher Education. Educational Technology Publications, Englewood Cliffs, New Jersey, 1975.

[3] Base data refers to that information that is collected before a project begins so that comparisons can be made after it is underway.

Chapter 8

State of ID Systems Approach Models

Madeline J. Trimby
Castelle G. Gentry

An important aspect of the development of the theoretical foundations of educational technology is the application of General Systems Theory to the analysis of the various processes educational technologists engage in.

The present chapter reviews recent instances of this analysis, and then discusses the process of analysis itself.

INTRODUCTION

The author's purpose in writing this chapter is to present to the reader a review of the current state of instructional development systems approach models. Systems approaches abound in education today, and especially in the field of instructional development. Such approaches vary from the simple to the complex, and may or may not be accompanied by graphic representations or models to explain the process. But what is this process? Why are models necessary, or even desirable? What relationship does this process or these models have to instructional development? It is hoped that this chapter will help answer these and other possible questions about systems approach models as applied to instructional development.

WHAT IS A SYSTEM?

Before looking specifically at ID systems approach models the authors have chosen to present, some basic concepts and definitions that form the backbone of such models must be examined. The most obvious place to start is with a definition of a "system" itself. Numerous definitions exist, but Heinich's definition of a system as "a process which synthesizes and interrelates the components of a process within a conceptual framework, insuring continuous, orderly, and effective progress toward a stated goal" (AECT, 1979) seems to be a relatively simple yet comprehensive definition. The universe is the most typical example used to illustrate a system, with the various galaxies being components of the universe. By analyzing the interrelationships of the parts (in this case the galaxies), the whole (the universe) can be better understood and dealt with. However, as one looks at these relationships and parts, it soon becomes obvious that these parts themselves consist of parts, which in turn also consist of other parts, etc. This identifies the concepts of suprasystem (or the larger, all-encompassing environment), system (an identified part of the larger environment), and subsystems (or the smaller, component parts of the system). It is possible also to carry such identification further to supra-supra-systems, sub-subsystems, etc., depending upon how far the division is taken--and also upon the vantage point from which the identifications are first made.

An educational example of this suprasystem, system, subsystem concept can be seen with the identification of a school district as the suprasystem, the school itself as the system, and a single classroom within the school as a subsystem.

Once again, one's vantage point is important and must be identified; the suprasystem might have been the state department of education, or even education at the national level; or the classroom might have been defined as the system and units of instruction as the subsystems.

OTHER SYSTEMS THEORY CONCEPTS

Other basic "general systems theory" concepts can also be of assistance in understanding the systems approach. Depending upon how freely the system can exchange information and energy with its environment a system may be termed as open or closed. An open system permits fairly free transmission of information or energy across its boundaries; whereas a closed system restricts the amount of information and energy that goes in and out. An adaptive system is one that is capable of making modifications to its structure so as to permit a more advantageous relationship with its environment. The classroom mentioned previously would be viewed as a closed system if it attempted to be entirely self-contained, relying upon resources within the classroom and excluding most other resources available within the system. However, if this classroom should decide to adapt to new conditions and requirements, to take advantage of external sources and experiences available to it, and to consider new ideas and innovations, it would become an open system.

All systems must have definable goals, with suggestions as to how these goals will be reached. In education, these suggestions take the form of measurable objectives, usually called behavioral or performance objectives. How effectively and efficiently these objectives are being met can be evaluated and the results given back to the originator of the system in the form of feedback so that necessasry adjustments can be made. This feedback is also used to continually monitor system activities.

One other general systems concept should be mentioned. The concept, equifinality, expresses the idea that the final end result or state may be reached in a variety of ways from a number of different starting points. The systems approach analyzes alternative ways of reaching that important end result or state (or goal) to determine the most effective and efficient way of reaching it. By analyzing the effect of each step or activity upon the entire system and by using problem-solving techniques, the most appropriate method and solution may be determined.

SYSTEMS APPROACH

As alluded to above, a systems approach is a problem-solving process. As such it is a management tool that organizes decision-making systematically, allowing the user to examine and interrelate all aspects of a problem and to analyze the effects of one decision over another in solving that problem. In other words, rather than a hit-or-miss or off-the-cuff method of solving a particular problem, the systems approach uses a step-by-step procedure: (1) to analyze the problem, (2) to determine possible solutions or decisions regarding the problem, (3) to consider the ramifications of each of these solutions or decisions, and (4) to appropriately relate and analyze all of these considerations in order to reach a final solution/decision. It is, of course, essential to know what your final goals or objectives are, and the value that you place on the alternative ways of systematically reaching those goals.

The development of such a systematic procedure or process in education traces its roots back to the development of weapons systems in the military (Twelker, 1971) and to the widespread use of audiovisual materials in military and industrial training programs during World War II. The industrial influence also was felt through the increasing use of interconnected networks of complex machines, which led to automation--and the heart of automation was the system. Automation also touched education and instruction, as television, language laboratories, teaching machines, and programmed learning were introduced. "About 1960, the phrase 'total systems approach' came to be used to describe the interaction of men and machines within the context of an organization in terms of specific tasks and outcomes" (Saettler, 1968). Title III of the National Defense Education Act (1958), Ford Foundation grants, and technological advances in computers also influenced innovations in instruction, as did additional developments of hardware and corresponding software.

There has been concern expressed in the last few years (Bratton, 1977; Sherman, 1978; Chadwick, 1979) that some users of the systems approach are caught up in the "systematic" aspect of the systems approach and have tended to lose sight of the wholistic view. As pointed out by Sherman (1978), "...the whole is seen as greater than the sum of its parts. The systems approach deals with the whole; the individual parts or components are important only as they relate to the whole." In addition, Chadwick (1979) points out that systems approach is "a point of view and therefore one must look at a system not only from the standpoint of its internal efficiency and functioning but, more importantly, one must find and study the relations of the system with all of the other systems in its environment." Bratton (1977) is one who suggests a movement away from the systematic approach toward a systemic approach in ID by giving the example of changes in the two editions of Kemp's Instructional Design. Bratton points out that "in the first edition, a procedural ID model is presented; in the second edition, a systemic ID model is described." (Bratton, 1977). These differences can be seen in the two models illustrated in Bratton's article, and reproduced as Figures 8-1 and 8-2 below:

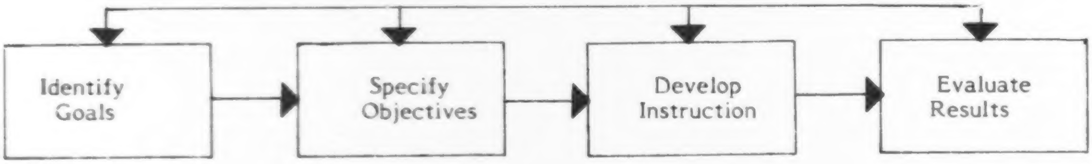


Figure 8-1. The systematic (Bratton, 1977, p.60).

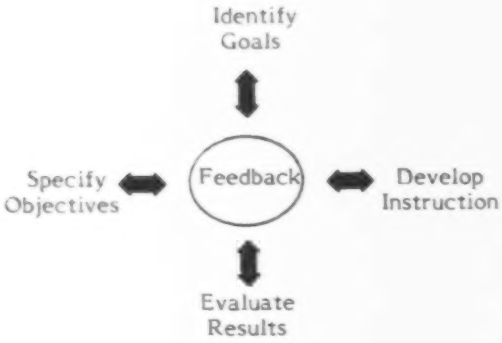


Figure 8-2. The systemic (Bratton, 1977, p.60).

Concern has also been expressed (Arnn and Strickland, 1975; Harmon, 1979) for the human aspect of the systems approach. Harmon suggests a more holistic model for human performance analysis, and Arnn and Strickland discuss the critical element in the success of any systems approach as being the involvement of the participants. Since Arnn and Strickland are concerned with the "human system," which they feel exists any time two or more people interact, they question the apparent emphases taken in a "typical systems approach" within the following areas: (1) Problem vs. people, (2) Product vs. process, (3) Objectives vs. obstacle orientation, and (4) External vs. internal direction. After discussing some of their biases and assumptions concerning these emphases, they remind the reader that they are placing a higher priority on the people who comprise the system than on the system itself, and that "it is the effectiveness of the participation of the people which determines the effectiveness of the system." The individual steps that they then suggest for their human systems model are: 1) Initiate interaction, 2) Identify goals, 3) Identify obstacles, 4) Develop and implement strategies, and 5) Evaluate and modify.

MODELS

We have mentioned the term "model" a number of times, and it is appropriate to clarify that term. Various authors in the literature (Mauch, 1962; Black, 1973; Smith and Murray, 1975; Lowther and Saltinski, 1975) suggest that the term may be used in any one of the following four ways: 1) scale models--a scaled-down version of some original object, especially such as an airplane, train, city, etc.; 2) analogue models--in which an isomorphic relationship exists between the model and the original entity; 3) exemplar models--a type of design or conception of things worthy of imitation, such as a model "program", a model "curriculum", etc.; and 4) theoretical models--models with explanatory and/or predictive features used to solve a particular problem. Smith and Murray (1975) suggest that the third definition above is the one that is typically used in educational development and evaluation; that is, that development and evaluation models are simply designs of exemplary processes or procedures. Most of the models here also fall into this category.

EDUCATIONAL TECHNOLOGY/INSTRUCTIONAL TECHNOLOGY/INSTRUCTIONAL DEVELOPMENT

Before proceeding to a more detailed discussion of models of the instructional development systems approach, there is one more area in which some definitions are appropriate. The terms "educational technology," "instructional technology," and "instructional development" all are used at various points in discussing different models of the educational systems approach. These terms are often used synonymously or interchangeably, but for our purposes we are assuming the acceptance of AECT's definitions for these terms. Thus, **educational technology** is

> ...a complex, integrated process, involving people, procedures, ideas, devices and organization, for analyzing problems, and devising, implementing, evaluating and managing solutions to those problems, involved in all aspects of human learning. (AECT, 1979)

Instructional technology, as a sub-set of educational technology,

> ...a complex, integrated process involving people, procedures, ideas, devices, and organization, for analyzing problems, and devising, implementing, evaluating and manag-

> ing solutions to those problems, in situations in which **learning is purposive and controlled.** (AECT, 1979)

and finally, **instructional development** is defined by AECT as

> ...a systematic approach to the design, production, evaluation and utilization of complete systems of instruction, including all appropriate components and a management pattern for using them. (AECT, 1979)

The latter two definitions are depected graphically in the Domain of Instructional Technology Model (Figure 8-3) below:

Thus, we are using the process-oriented definition of instructional development rather than the product-oriented meaning that has been used by some in discussing the topic. These definitions, along with the other definitions and concepts thus far presented, provide the context for the main topic of this chapter: models of the instructional development systems approach.

ID SYSTEMS APPROACH MODELS

There is certainly an abundance of instructional development systems approach models in existence today. All one has to do is flip through the pages of the various journals within the field (especially Educational Technology, for example) to find graphic illustrations and descriptions of new models. Such models may cover instructional development as a whole, or specific aspects within the overall process. Oftentimes these new models are a synthesis of previous models (i.e., Stamas, 1972; Knirk and Gentry, 1971; Twelker, 1972; Felker and Shettel, 1975), or are the application of a model to a particular type of instructional method or strategy (i.e., individualized instruction, competency-based instruction, computer-based instruction, games and simulations, etc.) or to particular fields of study within education (i.e., teacher education, vocational education, etc.). As one reviews the literature it becomes obvious that "THE" model for instructional development probably has not been (and may never be) written, or at least agreed upon, by a majority of people in the field. The basic reasons for this seem to be the same reasons why new models continue to be created--each person sees her/his situation as just enough different from other situations, or the desired emphasis as just enough different, that it seems to be necessary to revise or adapt an existing model, or to create a new one, to fit those situations and emphases.

Most of the overall instructional development models reviewed, (those covering the entire process) despite differences in terminology, cover the four basic components of:

1. Definition
2. Development (which includes design)
3. Evaluation (assessment)
4. Revision/Implementation,

with some type of feedback loop connecting at least two if not all of the components. Twelker (1972) and Durzo, Diamond & Doughty (1979) graphically depicted these elements as in Figure 8-4:

Within these four components, many, if not all, of the following activities take place (although not always in the order listed here):

1. Assess needs
2. Identify and/or analyze problems
3. Define settings
4. Determine goals
5. Specify behavioral objectives
6. Analyze tasks
7. Analyze resources
8. Select design formats
9. Select methods/strategies/materials
10. Organize management
11. Develop prototypes

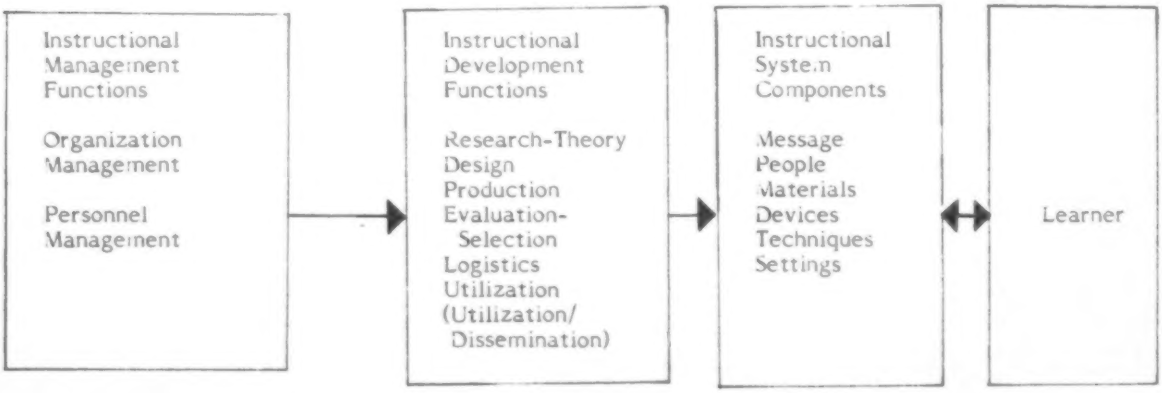


Figure 8-3. The domain of instructional technology model (AECT, 1979, p.12).

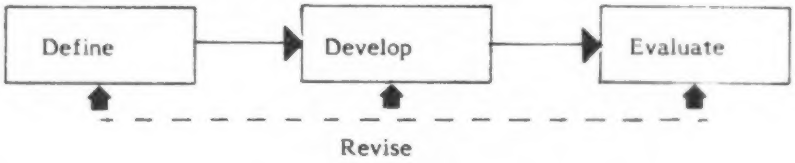


Figure 8-4. Systematic approach to instruction (a simple model).

12. Try out prototypes
13. Analyze tryout results (evaluate)
14. Modify or revise, as necessary
15. Recycle or implement

Resnick (1972) sees the four basic components as answering the following four questions:

1. Where are we now?
2. Where are we going?
3. How shall we get there?
4. How will we know when we have arrived?

"...Where are we now? deals with the assessment of a current educational system and an analysis of its existing resources, personnel, facilities, and program...Where are we going? relates to the establishment of goals and objectives...How shall we get there? is essentially a management issue...and How will we know when we have arrived? deals with the evaluation of the system." He graphically depicts his model as in Figure 8-5: The evaluation component suggested above is comprised of four categories: 1) Effectiveness (essentially an evaluation of the student, or product evaluation; 2) Efficiency (consisting of two factors: a. cost-effectiveness, and b. time criteria); 3) Affectiveness (essentially a process evaluation as opposed to a product evaluation, dealing with the attitudes and values of the student); and 4) Relevancy. Since it is a goal-referenced model, he sees "the key criterion by which the effectiveness or adequacy of the performance of a system should be evaluated is how closely the output of the system satisfies the purpose for which it exists."

Several other authors (Tuckman and Edwards, 1971; Romiszowski, 1973; Jonassen, 1978) suggest that the common components of the systems approach be labeled: 1) **Analysis** (defining the purposes and parameters of the system, determining learning goals and instructional objectives, analyzing and describing learner tasks to be performed, and constructing criterion tests)--(Jonassen, 1978); 2) **Synthesis** (specifying instructional strategies and procedures, designing evaluation procedures, and constructing a trial solution); and 3) **Operation** (implementing the instructional activities and collecting evaluation data). The data collected during the evaluation portion of the operation phase is analyzed and fed back into the system for any necessary revisions (or further analysis and synthesis, and then further evaluation, until an optimal solution is developed). Each of the authors then presents a breakdown of these three phases into the various steps that they see as part of the process, with accompanying flowcharts.

Lippert and Drucker (1973) describe a technique, using simple index cards, which they call Lippert Cards, to facilitate the process of analysis and synthesis of tasks. This technique, similar to a nominal group process, allows for the flexibility of re-grouping tasks and sub-tasks without rewriting entire lists or redrawing suggested diagrams.

Silvern (1980) uses somewhat different definitions of analysis and synthesis as he combines them with modeling and simulation to form a systems engineering process called anasynthesis. Although he developed this process almost 20 years

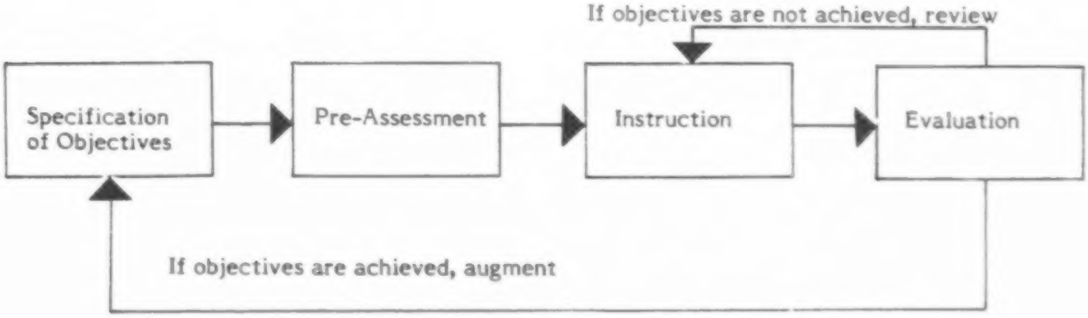

If objectives are not achieved, review
Specification of Objectives
Pre-Assessment
Instruction
Evaluation
If objectives are achieved, augment

Figure 8-5. Resnick's model (Resnick, 1972, p.156).

ago and has applied it to decision-making and problem-solving in the education and training fields, he feels that "only highly innovative and imaginative educators embrace it." He later states that "it is a rather complex and rigorous process of mental gymnastics, involving a dedicated handful of highly motivated educators; for these reasons, it is not widely thought by educators in the U.S. to be of great worth." The general process of anasynthesis consists of these four parts:

1. Analysis is performed on existing information to identify the problem, identify existing elements, and identify relationships of these elements;
2. Synthesis is performed to combine previously unrelated elements and relationships into a new whole;
3. Modeling is conducted; models, usually in flowchart format, are constructed on paper to predict effectiveness without actual implementation of the system;
4. Simulation is performed using the models, which reveal alternative solutions. (Silvern, 1980).

Although many of the models of the ID systems approach deal with the overall instructional development process, a number of the models deal with specific aspects within that process. The following section deals with some of these aspects, and some of the models that describe each particular aspect.

INSTRUCTION/TEACHING/LEARNING

In the continuous attempt to improve the instruction/teaching/learning situation a number of authors have set forth various systems or models. For example, Lavi (1975) suggests a design for a Dynamic Learning System (DLS), in which dynamic learning is defined as "an efficient, active process wherein the learner participates, investigates, and inquires"; [an approach which the author feels is] "responsive to man's needs (and society's demands) throughout his life span." Further, it is suggested that the system is an "approach" and not an end in itself, and that it is "dynamic in the sense of active participation and is open to redefinition, updating and change from outside sources and through a process of re-evaluation.

Thiagarajan (1974) descibes an ID model of interactive teaching; a model which "incorporates many principles of instructional development, yet retains the element of face-to-face teaching." After showing the model and describing the steps, he states that he has taught this model to a number of in-service teachers and, in the process, used the model himself, and that all agree that it works. His final statements are that "compared to concentrated instructional development, this process is slower. But the results are surer and we do not have to stop the world of the classroom while developing instruction."

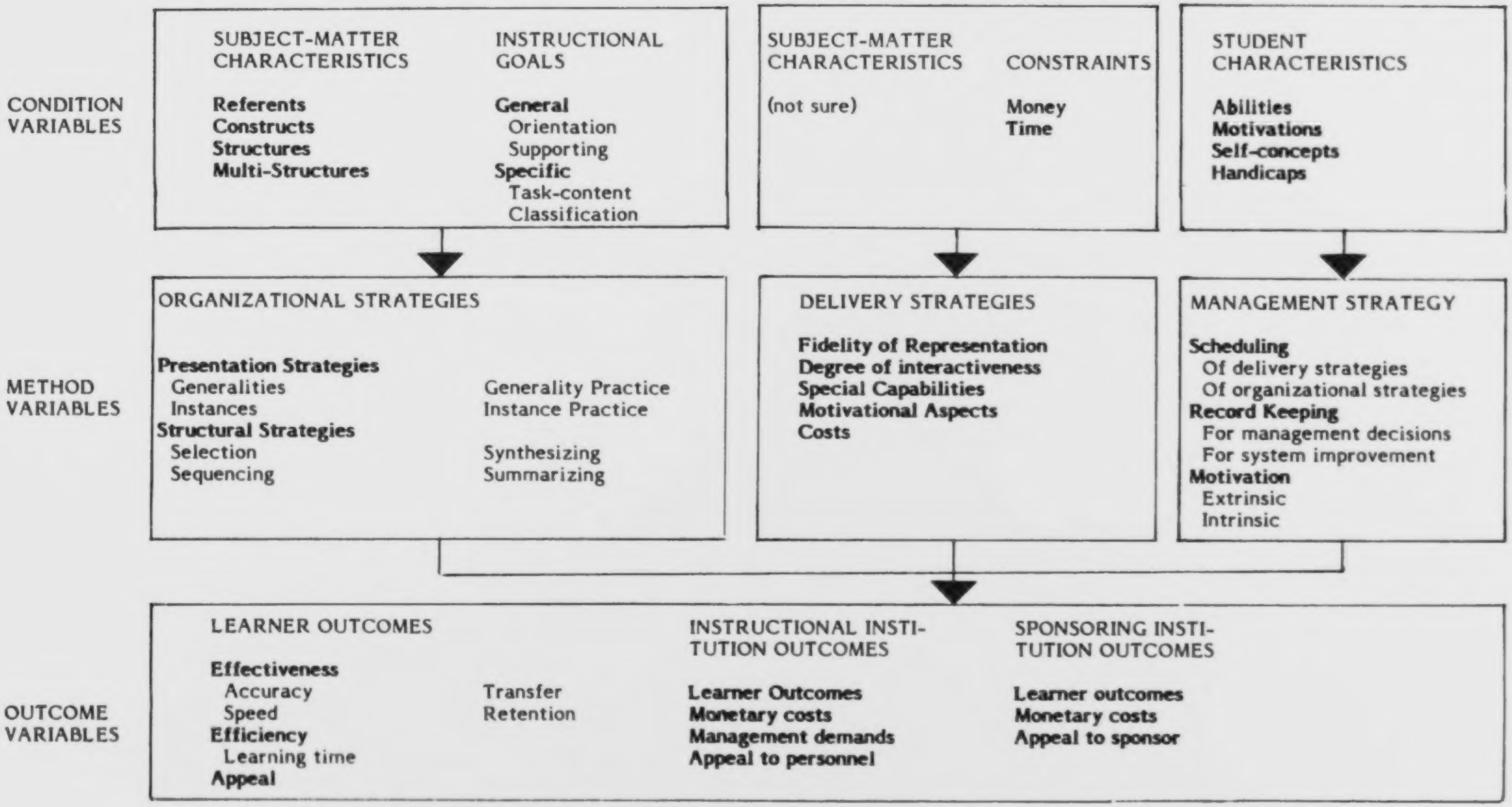
Finch (1973) focuses upon "the establishment of an instructional model which is based upon information provided by teachers. The model is intended to serve as a means for categorizing media in accordance with teachers' perceptions of the various media." Thus, rather than being a "provider"-based model it is a "user"-based one which establishes a generalized classification of instructional media.

A functional analysis of the classroom is made by Tosti (1968), who first describes general objectives of any operational system, and then the use of the PRIME (PRescription, Instruction, Motivation, Evaluation) model to conduct research on procedures which may better achieve objectives. The general system objectives which he describes are that the system must be: 1) Effective, 2) Efficient and economical, 3) Self-sustaining, and 4) Communicable. He then describes the prescriptive process, with its two phases (initial assessment and differential assignment) and its primary objective of directing "the learner through those materials necessary for him to achieve the desired objectives." His conclusion is that "the PRIME model has been successfully employed in the establishment of several operating classrooms...[and that] both the learners and the instructors like the way the system operates." In addition, impressive grade level gains have been made after 70 to 80 hours of instruction.

The perspective principles of instruction, especially as they provide a knowledge-base for the professions of instructional design and evaluation, are also a concern of Reigeluth and Merrill (1979). Since they feel that prescriptive principles of instruction describe cause-and-effect relationships among instructional variables, they are concerned that these instructional variables be clearly described and unambiguously labeled before being used to develop principles and theories of instruction. They describe these variables and classify them in the scheme illustrated in Figure 8-6.
They indicate their belief that these classes of variables should be considered when one is: 1) designing instructional materials, 2) doing research on instruction, or 3) developing better methods of instruction (theory-construction). Whereas some work has been done on postulating and testing such casual relationships, they contend that a majority of the necessary work remains to be done.

One attempt at developing a better method of instruction is Reigeluth's elaboration theory (Reigeluth, 1979). This theory deals primarily with macro strategies for organizing instruction (although it also includes many motivational strategies), as opposed to the standard way of organizing instruction based on a hierarchical task analysis. He uses an analogy of a zoom lens to describe the nature of his elaboration model, whereby a person starts with a wide-angle view showing major relationships and parts of a picture without any detail, then zooming in on a part of the picture. In this case, the zooming operates in steps or discrete levels, until the desired level of detail is reached. The author feels that if cognitive instruction is organized in this general-to-detailed way, "instruc-

Figure 8-6. (Reigeluth and Merrill, 1979, p.3).


CONDITION VARIABLES
SUBJECT-MATTER CHARACTERISTICS
Referents
Constructs
Structures
Multi-Structures
INSTRUCTIONAL GOALS
General
Orientation
Supporting
Specific
Task-content
Classification
SUBJECT-MATTER CHARACTERISTICS
(not sure)
CONSTRAINTS
Money
Time
STUDENT CHARACTERISTICS
Abilities
Motivations
Self-concepts
Handicaps
METHOD VARIABLES
ORGANIZATIONAL STRATEGIES
Presentation Strategies
Generalities
Instances
Generality Practice
Instance Practice
Structural Strategies
Selection
Sequencing
Synthesizing
Summarizing
DELIVERY STRATEGIES
Fidelity of Representation
Degree of interactiveness
Special Capabilities
Motivational Aspects
Costs
MANAGEMENT STRATEGY
Scheduling
Of delivery strategies
Of organizational strategies
Record Keeping
For management decisions
For system improvement
Motivation
Extrinsic
Intrinsic
OUTCOME VARIABLES
LEARNER OUTCOMES
Effectiveness
Accuracy
Speed
Transfer
Retention
Efficiency
Learning time
Appeal
INSTRUCTIONAL INSTITUTION OUTCOMES
Learner Outcomes
Monetary costs
Management demands
Appeal to personnel
SPONSORING INSTITUTION OUTCOMES
Learner outcomes
Monetary costs
Appeal to sponsor

tion will result in higher levels of learning, synthesis, retention, and affect," and that although the model and procedures "have undergone very limited field testing and virtually no research," there is great potential for the elaboration model to meet the need for alternative instructional design approaches.

MANAGEMENT

One of the important components of instructional development systems approaches is management, whether it be of the entire process itself, or of specific aspects within the process. Of the various models available covering the overall process, the management framework model proposed by Gentry (1977), as it applies to teacher education programs, is probably one of the more detailed models. The components of the model are grouped into cyclical components and supporting components, connected by a communications network, with a range of techniques suggested for operating these components.

Conkright (1979) suggests a three-dimensional model as a systems approach to managing complex educational projects. This model, consisting of program phases, program elements, and program controls, "provides a vehicle for analyzing project needs, for staffing project personnel, and for tracking project tasks to assure a unified, coordinated effort." Although the model is "still in its formative stage--still subject to the demands of multiple field tests...its validity and practical application are considered high within experienced Control Data management."

For those concerned with instructional accountability, Gorman (1979) suggests the Instructional Management Accountability Model (IMAM) as a possible approach. This model consists of "three essential interrelated elements; the instructional program, the supporting facility, and the involved staff. It can be applied to an unlimited number of instructional disciplines, programs, or areas."

Lowe and Schwenn (1975) also are concerned with a variety of educational settings, and especially how the instructional development process functions in such a variety. In order to attain greater generalizability of ID models, they suggest that descriptive data, with detailed accounts of how the ID process progresses and performs, is needed. Documentation, or the "coordinated activity of preserving proposed and developed plans of activity and collecting and recording detailed accounts of how these plans are realized," is the system they suggest to accomplish this task.

One subset of the management function of an instructional development project is the management of personnel. Stone (1975) suggests several alternative ways of organizing the personnel structures to be used in projects involving the preparation of multimedia instructional materials. These structures consist of: 1) the specialist approach (all steps performed by a single instructional technologist), 2) the chain approach (a variation of the specialist approach whereby overlaps or links are deliberately planned), 3) the interdisciplinary team approach (teams formed, composed of persons with different specializations), and 4) the matrix approach (in which the organization, in addition to the general management groups, is composed of two types of entities: functional groups and projects). The matrix approach aims at the efficient use of personnel, using a specialist only when needed by the project; functional personnel ensure that technical standards are followed; and a project manager deals with day-to-day problems and keeps the project moving toward its objectives.

Brien and Towle (1977) also are concerned with the amount of time, specialized manpower, and money that is often required in producing effective instructional systems, especially in highly specialized areas. They, too, suggest a team approach, but instead of the instructional devleopment team being composed of only two people (the instructional designer and the subject-matter expert), they suggest the addition of a "third man" to the team. This third member, who should possess a few skills in instructional design and who also should have some knowledge of the subject matter, but who is not expected to be an expert in either area, may "provide the bridge between instructional design activities and the subject matter to be taught." Such a procedure will decrease the requirement of the instructional designer to become acquainted with the subject matter and will reduce the costs involved with the subject-matter specialist. The procedure is carried out in the following way:

> For each step of the process in the design and development of an instructional system, the "third man" writes a draft which is reviewed and revised by both the subject-matter specialist and the instructional designer in order to determine if the "principles" in their fields have been respected. The tasks of the instructional designer and subject-matter specialist consist mainly of supervision and review of proposed instruction rather than the time-consuming creation of instruction. (Brien and Towle, 1977).

Techniques are then suggested for reducing the time for executing the steps in process.

Another subset of the management function in instructional development is the decision-making process, with various models outlining this process. For example, Ames, Linden, and Feldhusen (1977) describe a Guided Design systems approach, which "provides a means for giving careful guidance and feedback to small problem-solving groups." Used as a new approach to Stage Two of the Purdue Three-Stage Model for College Course Design, this approach: 1) replaced the basic, general problem-solving model with a series of instructional decision-making models; 2) divided Group Instruction guides into two sections so students could learn how to make and implement decisions; and 3) expanded the Group Feedback so that students could evaluate the worth of their own decisions and products, rather than just comparing them to the response of an "expert." Thus, "this system of instruction results in students who can solve educational problems using a decision-making process consistent with current instructional theory."

Decision-making is also discussed as a hierarchical and sequential process involved in media selection (Tiffin and Combes, 1974), and as two procedures for facilitating the use of controversial instructional materials (Splaine, 1977). The latter two models are involved with: 1) decision-making for selecting controversial materials, and 2) the involvement of important groups and persons in selecting controversial materials.

NEEDS ASSESSMENT

Another important component of instructional development systems approaches that is not only one component of the entire process, but one which also yields many models in and of itself, is the topic of needs assessment. Essentially, needs assessment is a process for identifying and measuring gaps between **what is** and **what ought to be**, prioritizing the gaps, and determining which of the gaps to work on to obtain closure. Some of the often-discussed and used models for needs assessment are Kaufman's "Needs Assessment" (1975), Coffing's "Client Need Assessment" (1977), Lee's "Needs Assessment Model" (1973), and Harless' "Front-End Analysis" (1975) models. (See Trimby, 1979 for an analysis and analytical matrix comparing these four models.) An instructional designer's role in needs assessment may vary anywhere from designing and conducting needs assessment studies, to assessing already-completed studies, to identifying which needs have the greatest potential impact, to simply utilizing a given list of instructional goals for which instructional materials and procedures are to be designed. (Dick and Carey, 1977). Therefore, Dick and Carey suggest procedures or steps the designer can employ in proceeding from needs assessment to systematically-designed instruction. These steps are based on four possible entry points for the designer: 1) needs assessment, 2) documented needs, 3) instructional needs, and 4) instruction. The steps involve a framework for summarizing findings, identifying study limitations, validating identified needs, differentiating between instructional and noninstructional needs, categorizing needs into clusters, selecting needs with the greatest potential for program impact, and converting prioritized lists of instructional needs into instructional goals. All of this is done while keeping in mind that special organizational considerations may affect the design and the implementation of instruction.

EVALUATION

Still another essential component of most instructional development system aproaches, and one which also has its own models, is evaluation. These include such models as the CIPP Model (Stufflebeam, 1968), the Countenance Model (Stake, 1967), the Discrepancy Model (Provus, 1971), and Scriven's Formative Evaluation Model (Scriven, 1972). Baker and Alkin (1973) give a review of the research pertinent to formative evaluation of instructional development, noting that at that time the research was relatively limited. Tennyson, in his model (1978) includes evaluation in every phase of development (the four phases are: assessment, design, production, and implementation), which he claims makes his model different from earlier instructional development models. (His model also differs from earlier models in that he gets away from the flowcharting idea; he states, "The instructional development model described in this paper was deliberately constructed to eliminate the boxes and arrows commonly used to illustrate how development works." The four types of evaluations matched with the four phases of the model, are: 1) Assessment phase--feasibility evaluation; 2) Design phase--formative evaluation, 3) Production phase--summative evaluation; and 4) Implementation phase--maintenance evaluation.)

An evaluation system similar to a management-by-objectives system is suggested by Orlich (1979). "This system is designed for goal-directed activities and for those who desire to use evaluation as one means by which to improve any educational efforts and behaviors." He utilizes a planning/evaluation grid, contingent upon the availability of three components: "1) a concept or practice which is to be assessed, evaluated, or judged; 2) a series of selected variables or key descriptions pertaining to the concept; and 3) a discrete series of evaluative criteria which form a logical gradation or continuum, one of which will be selected as the best fit for the current or anticipated condition within any specified program or project," Orlich suggests that anyone could make her/his own appropriate grid.

INDIVIDUALIZED INSTRUCTION/ COMPUTER-BASED INSTRUCTION

One of the instructional methods or strategies covered by a number of instructional development models is individualized instrucion. Francis Atkinson (1976) describes one such systems approach, to be used in designing original mediated instructional materials/activities or adapting existing materials/activities for individualized instruction. Practical guidelines are given in a nine-step model, along with six implementation considerations recommended for preparing for the teacher and four suggestions for preparing the student.

Joel Davis' three step model (1977) for the design and implementation of an individualized instruction program is an adaptation of Tuckman and Edwards' model (1971), mentioned earlier. The three activities involved in this case are analysis, synthesis, and operation; operation is a procedure to be used for determining an optimal individualized instructional program.

Consequences of the implementation of several commercially-developed individualization systems with respect to teacher beliefs and practices and to pupil attitudes and achievement are described in a report by Bosco, Harring, and Bandy (1976). The five systems included in the study reported by Bosco, et al., are: Alpha II, READ, PLAN, Learning Unlimited and McGraw-Hill Programmed Reading. These five management systems appear to produce an impact upon teacher's beliefs and practices, with less evidence of impact upon student achievement and attitude. Descriptions of other systems approaches to individualized learning, such as U-SAIL (Utah System Approach to Individualized Learning) and ACIL (Arizona Consortium for Individualized Learning) are described by Robinson (1975) and Webb and Howard (1977), respectively. The PRIME model (Tosti, 1968) has already been described in this paper in some detail.

Since some of the above programs have met with promising success, Spuck and Owen (1976) suggest that computer-based management information systems are essential to the effective implementation and operation of such programs. Their article considers "the structural components essential to programs of individualized instruction, leading to a model of a generalized computer-managed instruction (CMI) system. Lastly, extension of the CMI model which suggest applications in the evaluation of the instructional program are discussed."

Another example of utilizing the computer for instructional purposes is the adaptive model for utilizing data on learner characteristics in computer-based instructional systems, suggested by McCombs, Eschenbrenner, and O'Neil (1973). Since they feel that the affective or motivational component has not been explicitly included in most systems models, they have included this, along with cognitive learner variables, in their model for designing computer-based instructional materials.

SIMULATION/GAMING

Another instructional method or strategy in which systems approaches have been used in the design process is simulation/gaming. Atkinson (1977) describes such a systems approach, the first five steps of which are similar to the process used when planning most instructional activities. "By following these initial steps the designer will be able to determine the appropriateness of using simulation/gaming activities to solve a clearly-defined instructional problem...The decision to design a simulation/gaming activity should be made only after a careful analysis of each of the first five steps of this systems model." The following seven steps are concerned with decisions which must be made in designing a simulation/gaming activity; the last five steps (for a total of 17 steps) are concerned with several other important decisions to be made and related materials to be developed.

Other authors concerned with the design of simulations/games have suggested models for such purposes as designing simulations for orienting new employees to their job situation (Stonewater, 1978); for decision-making (Easterly, 1978); and for designing and implementing the use of human simulators, not only in the medical field, but in other fields as well (Collart, 1979).

MODEL ANALYSIS AND SELECTION CRITERIA

With such a vast array of models in existence, covering not only the entire instructional development process, but specific aspects as well, how does one go about analyzing such models, and selecting one that is appropriate? Through an examination of a broad range of models, it is clear that their functions vary from model to model. Based upon that variance, criteria in the form of questions have been derived. Although not an exhaustive list, these criteria, listed below, should give the reader a good start in looking at and choosing a model. They may also convince readers of the need to synthesize a new model from existing ones in order to meet their special conditions.

1. **Audience being addressed.** Is the audience being addressed by the model stated, or merely inferred? How similar is it to the audience you are working with? Is it a sophisticated or more beginner-type audience?

2. **Particular emphasis desired/focus of model.** What is the emphasis of the model? How many functions are covered by the model? Does it cover an over-all process, or just some aspect of that process? Is it process-oriented, or product-oriented? Which orientation is most appropriate for your particular situation?

3. **Structure of model/linear or non-linear.** Is the model so structured that it is a step-by-step approach that must be followed exactly? Or is it more flexible, allowing entry at a number of points (or at any point)? Is it possible to re-cycle to an earlier point, if necessary? Is there information flow between and among the steps (feedback)? Is there a flowchart of the over-all process, as well as narrative description of each of the steps, so that the model can be fully understood?

4. **Relationship of developer to client.** What is the relationship of the developer to the client? Is the client continually involved in the process? (which may require additional interpersonal skills on both parts), or does the developer have "free reign" for the design and development? Must each step in the process be approved by the client?

5. **Individual or team oriented (Who is responsible for development).** How many people will be involved in the development process? Is it strictly a one-person type process, or will a team

of developers be necessary? Where do subject-matter experts enter the picture? (If at all--or is the developer expected to be a subject-matter expert, as well?) As above, must each step be checked and approved by the client, or may the developer(s) proceed as necessary?

6. **Potential for implementing.** What is the potential for implementing a certain model in your particular situation? Is the model in question such a drastic change from your current situation that a large-scale "diffusion of an innovation" process would have to be undertaken? Would certain steps in the model pose problems for certain people within your organization, or within the general political structure of your organization? Would the implementation require additional funding that might be very difficult to obtain? Would those involved see it as an improvement over current practices? (And more importantly, would it really **be** an improvement?)

7. **Life expectancy of project/process.** What is the life expectancy of a particular project or process for which the model is being considered? Is it really worth the extra time, cost, efforts, etc. to adopt the model, expecially if for a short-term project? Or, is it a process that, once established, could potentially be used for a long time in the future?

8. **Cost effectiveness/efficiency.** Is there some way (either provided, or that you can determine) to analyze the cost effectiveness/efficiency of the model in question? (I.e., as compared to your current situation, or compared to other models that you might also be considering?)

9. **Research support.** Is there research support for the model, or is it just someone's "good idea" that looks as though it would work, but hasn't been tested? Is someone just "re-inventing the wheel?" or is the model new and different and a worthwhile change?

PROCESSES COMMONLY USED TO DEVELOP SYSTEMS MODELS

Application of the criteria presented in the preceeding section indicates why new models are constantly being derived. Listed below are some of the processes commonly used to develop systems models.

Adaptation/Modification of an Existing Model

As has been mentioned previously, one method for developing a systems model is to adapt or modify an existing model, especially in order to fit it to a particular situation. Depending upon the extent of revisions, adaptations, or modifications, or the way in which the model will be applied, the resulting model may be considered as a "new" model.

Synthesis of Existing Models

Another method that may be used to create or develop a new systems model is to combine or synthesize several existing models. In this case, certain aspects of each of the various models are viewed as being desirable, and are combined to form a new, synthesized model. As above, this is often done in order to fit a particular situation or an intended usage of a model.

Creation of a New Model

Probably the most difficult way to create a new model is to start from scratch and build a model. Dorfman (1960) suggests three aspects to model building, all of which are closely related, but each requiring different skills. These three aspects are: 1) straight-forward description (expressing the situation under study in terms of the symbolism adopted)...frequently through the use of block diagrams and relationship lines connecting the boxes; 2) creative hypothesizing (the introduction of the motivational, behavioral, and technological assumptions that will be used); and 3) quantification (the assignment of numerical values to the parameters of the model.) (Dorfman, 1960.)

Lowther and Saltinski (1975) suggest that models possess certain similarities, such as being an abstraction of reality and emphasizing structure, relationship and process. In addition, they suggest the following additional attributes of models:

1. **Input Provisions.** The point through which data, either quantitative or qualitative, enter into the model is clearly specified.
2. **Direction and/or Sequence of Information Flow.** The model specifies the path and direction for the flow of data through it. Some models have intermediate checkpoints at which the data can be examined before completing the journey.
3. **Interaction-Synthesis Sectors.** Models have points or locations at which the input may be transformed or synthesized as a result of some process or interaction with some components.
4. **Constraints.** Those limitations and/or barriers in a system which prevent either the flow of data, or activities from taking place under specified conditions, are frequently incorporated into models.
5. **Output Provisions.** As with input, models are characterized by incorporation of clearly designated points through which data, or information, leaves them.
6. **Self-Regulatory Mechanism.** Finally, many models incorporate some type of self-regulatory mechanism which facilitates the comparison of the output with the input and thus provides a basis for evaluating a system's effectiveness in relation to its goals or purposes, or its ability to provide solutions to problems. (Lowther and Saltinski, 1975.)

And finally, Rubinstein (1975), in a chapter on the nature of models, in his book, Patterns of Problem Solving, suggests the following steps for the modeling process at an early stage:

1. Establish the purpose of the model.
2. List the possible elements (observations, measurements, ideas) which may relate to the purpose, however remote.
3. Select those elements of Step 2 which are relevant to the purpose in Step 1.
4. Aggregate elements which can be chunked together by virtue of the strong structural, functional, or interactive connections between them. This is a process of classification, in a sense.
5. Repeat Step 4 several times until a model consisting of seven, plus or minus two, chunks emerges.

(Rubinstein, 1975.)

While there are many other authors (i.e., Beauchamp, 1968; Snelbecker, 1974) who have given suggestions about how to develop models, the ideas presented here will give a starting point for readers who wish to create their own systems approach models.

CONCLUSION

This chapter has attempted to present the current state of development of models of the instructional development systems approach. It began with basic definitions of such concepts as: system; interfaces; open, closed, and adaptive systems; goals; feedback; equifinality; and systems approach. The development of the systems approach concept was briefly traced, and some of the concerns regarding this approach was expressed.

Models, and four ways the term is used, were then discussed, and then related to models of the instructional development systems approach. Basic components of systems approaches, and the different ways they are interpreted by a number of different authors, were presented, both in terms of the overall process, and of specific aspects related to: instruction; teaching; learning; management; needs assessment; evaluation; individualized instruction; computer-based instruction; and simulation/gaming. A partial listing of criteria to use in analyzing and selecting a model were suggested, as well as procedures for developing models.

Research Needed

One thing that was noticed while reviewing the literature is that very few of the authors who present systems approach models mention any attempts at validating their models through research. Stamas, in an earlier study of systems approaches, pointed out the same fact:

> "Few instructional developers have attempted to apply a model to developmental problems for the purpose of reporting consistencies and discrepancies in the model. Of significance also, is the fact that few, if any, instructional developers have reported strategies for measuring the effectiveness of development resulting from the application of a model." (Stamas, 1972.)

In addition, he found little or no evidence to indicate that any models were revised after study. Studies by Stamas (1972), Massey (1975), and Stolovitch (1975) were attempts, however, to validate certain models.

Diamond (1980), in his article on some of the problems, issues, and the future of instructional development, also points out the lack of research in the area of procedures and models (as well as organization, administration, and developer-client interaction). In addition, he states that "Graduates from one institution have often understood fully only one model and have discounted all others."

Future of Systems Approach Models

Undoubtedly, systems approach models for instructional development will continue to be developed in the future, some being adaptions or modifications of existing models, some being synthesized models, and some being newly created models. "THE" instructional development model probably never will be (and possibly should not be) created. However, as new models are developed and field tested, we may come closer to "THE" model.

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Chapter 9

Interface Analysis of ID Systems

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Madeline J. Trimby

Instructional development is a process which occurs within a system. A system exists within a context of other systems, and is in turn composed of subsystems. If the ID process is to proceed, the systems must all function. This requires that they interact; that is, information must be transmitted among them, and their behaviors must vary as a function of the information which they generate, transmit and receive. This information passes from system to system through parts called "interfaces." "Interface analysis" has to do with the identification of these parts, the measurement of their effectiveness, and their improvement.

Interface analysis is an emerging process which focuses upon the physical and conceptual boundaries among systems and subsystems. In this chapter, the case will be made that the study of these boundaries is of serious concern to instructional developers. Another term for the common boundary between systems is "interface." An interface, as defined by Webster (1966), is "a surface that lies between two parts of matter or space and forms their common boundary." This meaning will be expanded to include both physical and conceptual systems, and will encompass those interface characteristics which affect the exchange of essential information among systems, necessary for accomplishing instructional development tasks.

Instructional development systems consist of processes primarily designed to solve problems affecting instruction. A significant proportion of these problems are associated with system and subsystem boundaries, or interfaces. The following are examples of problems that often plague instructional developers, and that may be avoided through adequate interface analysis and design:

-Gatekeeper rejection after an ID project is underway
-Client misinterpretation of ID project goals and activities
-Incongruities within a client organization
-Loss of momentum after initiation of a project
-Conflicting expectations within the client group
-Raids on resources previously committed to an ID project
-Unclear Client/Developer lines of responsibility and authority
-Difficulty in obtaining essential information

The function of interface analysis is to generate information needed to solve such problems, or at least to provide early warning of their potential danger to instructional development projects.

A more formal definition of interface analysis is "the identification, interpretation, and prioritization of essential points of contact among system and subsystem boundaries." As stated earlier, an interface may be physical, conceptual, or a combination of the two. Figure 9-1 illustrates the boundary or interface between two subsystems of a message-generating system, namely, a typist and a typewriter. The obvious functional points of contact between these two subsystems are eyes, fingers, and typewriter controls (i.e., keys, line-space knob, carriage release, ribbon reverse, space bar, etc.) Imagine these same two subsystems with the points of contact removed (Figure 9-2). Clearly, without these points of contact, there is no interface. Also worthy of note is the effect of impairment on one or more or these points, ranging from arthritic fingers to a fading ribbon.

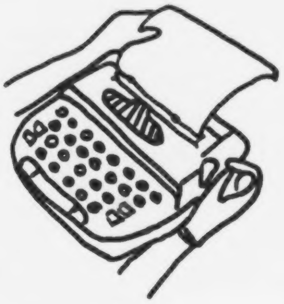


Figure 9-1.
With interface.

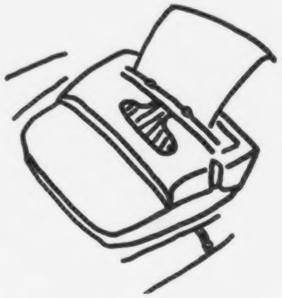


Figure 9-2.
Without interface.

Other examples of physical interfaces are those among the components of an automotive transportation system. Two of those components are the driver and her/his automobile. Major points of contact for the interface between these two components or subsystems would include: eyes, hands, and feet as the human part of the interface; and ignition key, steering wheel, gearshift, clutch, and brake pedal for the machine side. Again, the removal or impairment of any of the points of contact making up this interface may seriously reduce the effectiveness of the system. To gain a sense of the relative complexity among interfaces, compare the previous interface with the interface between a pilot and a 747, where there are over 2,000 points of contact between pilot and plane. To state the obvious, impairment of the points of contact in either system may result in a crash. It is worth considering that a significant number of ID projects also crash due to impairment of their interfaces.

Far more complex than physical interfaces, such as those described above, are social and organizational interfaces. Consider the possible interfaces within a large instructional development project. In Figure 9-3, a Venn Diagram is used to show some of the interfaces involved in a project for developing a competency-based program in a college. Each of the outside circles represents a major component of the ID system, with the inner circle representing a common interface among the other components. Such a common interface is often labeled as the information handling or communication component of a system.

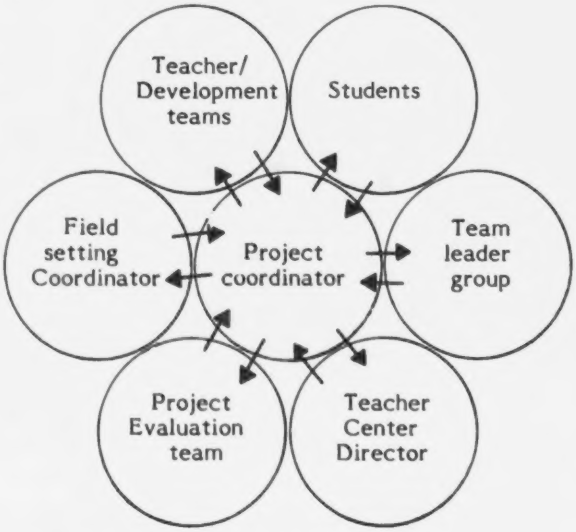


Figure 9-3. Components of an instructional development project.

THE STRUCTURE OF AN INTERFACE

A system may be defined as "a combination of interacting components that work in concert to accomplish a predetermined purpose." Given this meaning for system, components of a system, then, are dependent upon one another, and the operation of one may facilitate or inhibit the operation of another. The appropriate operation of these components in their common endeavor requires an exchange of essential information. As an example, the success of the ID project represented by the components depicted in Figure 9-3 depends upon an interchange of essential information between the project coordinator and each of the other groups involved. To some degree the same can be said about any pair of components in the system. Under this condition, interface analysis must have as one of its purposes the identification of essential information to be exchanged among the components of an instructional development system.

It is appropriate to point out the difference between identifying and using existing interfaces within a system, as compared to designing or modifying interfaces to fit specific needs. The first is used most often by those instructional developers employing reactive management strategies, while the latter are processes illustrative of proactive strategies. Designing or modifying interfaces requires greater resources for their implementation, but usually provides greater effectiveness and efficiency than the former.

Over time, a whole range of tools and models from a variety of disciplines has been brought to bear on system interfaces, under a variety of labels. Not the least of these are communication models. One such model is presented in Figure 9-4. This is a variant on the Shannon-Weaver Communication Model (1964). Such models are useful for analyzing interfaces. That is, they may trigger such questions as, "what is the message being sent, who should be sending the message, is the appropriate mode being used to transmit the message, and is the message going to the appropriate receiver?" In addition, the use of these models may alert the analyst to such problems as message distortion (noise), redundancy, data gaps, and information overload.

Another discipline with concepts pertinent to the study of interface analysis is cybernetics (Wiener, 1961). Cybernetics is concerned with the investigation of communication and control, within and across systems. Specifically, cybernetics is the study of the coordination, analysis, storing, and control of data and information as such processes may affect the proper functioning of systems. These processes can occur efficiently within a system only if all subsystems are functioning properly in their own right, and if all subsystems are interacting properly. Proper functioning of these systems depends to a large degree upon internal monitoring and the ensuing modification of system functions; this provides an operational meaning for the term "feed-back," a critical element in any system. The study of how feedback is produced, transmitted, utilized and lost within a system and between subsystems is called feedback analysis, and forms a major aspect of both cybernetics and interface analysis. More will be said of the function of interfaces in the regulation of feedback transmission, and its place in the management of a cybernetic device or structure will be discussed later.

TYPES OF INTERFACES

The reason for the existance of any interface is the exchange of essential information among systems or subsystems, and can range from a teacher responding to a student's question to a computer triggering a videotape. One way of classifying interfaces by type is by naming the generic nature of the two systems which are together producing the interface.

One type would be person-person, as in the case of the interface between a teacher and a student. Here the points of contact depend primarily upon speech and hearing apparatus, although other senses like vision and touch receive their fair share of information.

A second type would be person-machine. The typist-typewriter, driver-automobile examples, described earlier, fall into this class. Examples more relevant to instruction would be the interaction of teachers and students with instructional hardware (ex., television, slide-tape, etc.).

The third type of interface is machine-

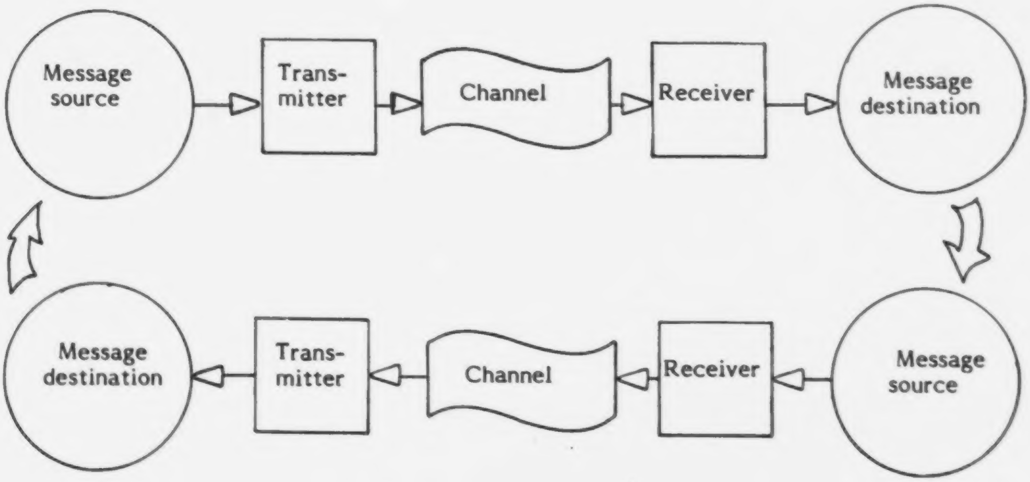


Figure 9-4. Modified Shannon and Weaver communication model.

machine. Common household examples would be the thermostat which turns a furnace on or off, and a recording device which can answer and record telephone messages. Machine-machine interfaces are less often found in instructional settings; where such an interface does exist in an instructional setting, it usually involves mechanical or electronic data-processing of some kind. Mechanical teaching machines and computer applications are the most common among these.

The importance of each of these types varies from setting to setting, depending upon its particular function in the instructional development project.

INTERFACE CHARACTERISTICS

There are certain general characteristics of interfaces which may be used to guide our analysis of them. A listing and a brief description of each of these characteristics follows:

1. **Permeability.** The ease with which information can travel across an interface from one component to another. The permeability of an interface may depend upon any number of factors. The organizational or administrative models controlling the interacting components is certainly a major factor. For example, a democratic administrative structure permits much freer access to and flow of information than does a militaristic administrative structure. Factors of language, values and culture may either inhibit or facilitate the exchange of essential information across an interface.
2. **Selectivity.** The constraints placed on access to information in a system or subsystem. The Great Wall of China, the Iron Curtain, government and corporate secrecy, privacy laws, all are indicative of systems which limit access to information. Knowledge of the rules which govern such access for client systems becomes necessary if instructional developers are to acquire the essential information to complete their tasks.
3. **Directionality.** The predominant direction in which information flows across an interface. The direction of information flow also depends to a large degree upon the administrative structures imposed upon an organization. In terms of models of administration, it is expected that information would flow primarily from the top down where militaristic models are used, and that information would tend to flow equally in both directions in democratic models. Early knowledge of the administrative model used by a client system could reduce false starts at acquiring information.
4. **Deprivation.** The effect on information flow resulting from inadequate resource support for an interface. It is rare that interfaces have access to either sufficient resources or skills for insuring adequate information handling. As a result, the anemic condition of most interfaces affects the amount and quality of information which can be transported across an interface.
5. **Visibility.** The readiness with which an interface can be identified. In every organization there are both formal and informal communication and information-handling systems operating. Some of the most valuable are found among the informal; however, their identification is not always easy. Techniques for identifying informal liaisons and communication links are available.
6. **Stability.** The degree to which an interface is well-established and dependable in providing a consistent level of information. As a general rule, older systems have more stable interfaces, while newer systems have less stable ones. By the same token, interfaces of the former type are much more difficult to change than those of the latter type.
7. **Dependency.** Degree to which a system or subsystem depends for its survival on the information provided by other systems or subsystems. Some systems are relatively isolated from others, almost self-sufficient within themselves; while other systems are highly dependent on the information flowing across their various interfaces. Some systems are so dependent that the closing down of a single interface could render the system ineffective in some critical operation.
8. **Capacity.** The quantity of information that can travel across an interface in a prescribed amount of time. There are peak periods in any system when the information needs are greater than at other times. If the information is not delivered in the appropriate quantity at the appropriate time, then the system's effectiveness and efficiency may be seriously affected. Part of the problem, in many systems, is that there is poor discrimination between essential and non-essential information. The non-essential information tends to clog the interface, slowing the essential.

RELATION OF INTERFACE TO SYSTEM APPROACHES

So far, interfaces have been discussed as they relate to specific systems (i.e., message generation, transportation). The power of systems thinking is that all relationships can be viewed as the interaction of systems or subsystems. There are natural systems, and there are man-made systems.

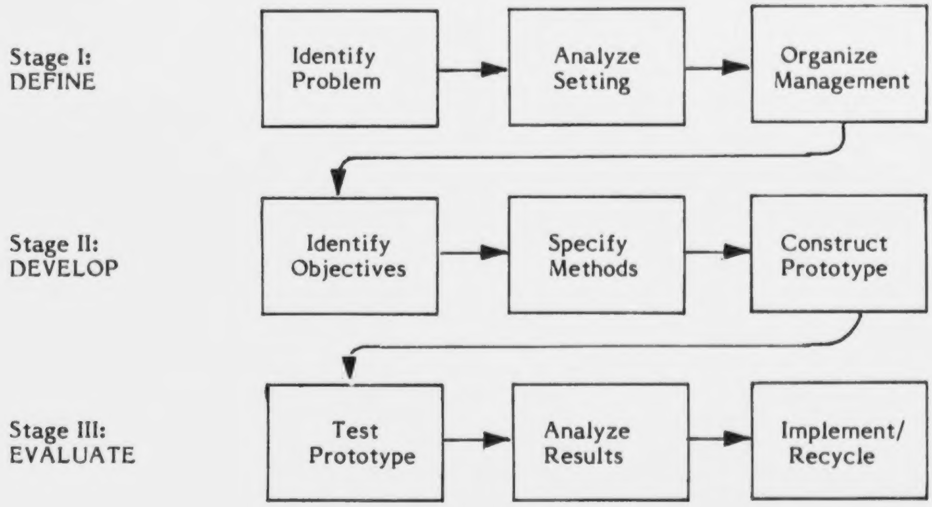


Figure 9-5. Instructional Development Institute systems approach model.

There are both physical and conceptual systems, and they may be arranged in a variety of combinations. They all have interfaces, or points of contact for exchanging essential information with other systems or subsystems. "System approaches" are special systems used by instructional developers to guide them through the process of developing instruction and concommitant organizational structures. Figure 9-5 is a graphic representation of one well-known systems approach (UCIDT, 1969).

This system is made up of a sequence of steps which instructional developers believe are essential for accomplishing their work. These steps may be viewed as "A complex plan or strategy which logically accounts for and relates in an orderly fashion: goals, behavior, instrumentation, and resources for the purposes of removing or reducing problems associated with the training or education of learners" (Educational Technology Glossary, 1977). One of the defining characteristics of a system is that the way in which one component functions affects how all of the other components of that system function. That is, how well a kidney functions determines how well other bodily organs function, or the timing of an automobile engine determines how well other engine components perform. So it is with system approaches. If we translate the components of the systems approach of Figure 9-5 into a Venn Diagram, as shown in Figure 9-6, we can get a better view of the important interfaces within this systems approach. The "Organize Management" component is made responsible for handling essential information required by the several components of the systems approach. Conceptually, it becomes the common interface for all of the interacting components. The arrows, in this case, indicate essential information being transferred from one component to another, via the "organize management" component. The instructional development model depicted in Figure 9-6, then, can in turn interface with a client system and other related systems, as shown in Figure 9-7.

AN INTERFACE ANALYSIS MODEL

The flowchart in Figure 9-8 illustrates a prototype model of inteface analysis. As more is learned about interface analysis, more sophisticated models are likely to emerge, but for our immediate purposes this model should serve as a conceptual frame for understanding interface analysis.

Steps one and fourteen of the model are provided for contextual purposes. Step two is concerned with the specification of the target system and any related systems which may be key to the instructional development project. Step two is carried out at some level for any ID project, but may require complex "systems analysis" techniques for more extensive projects. This step clarifies the boundaries of both the physical and conceptual systems that are likely to be involved in the ID project.

The third step in the process is to determine whether or not an instructional development project merits an interface analysis. Precise criteria for making that decision have not yet evolved, but elements such as size of the project, degree of support for the project, or number of people involved, give some direction. To say it another way, in those cases where the project is extensive, the number of people involved is large, and the

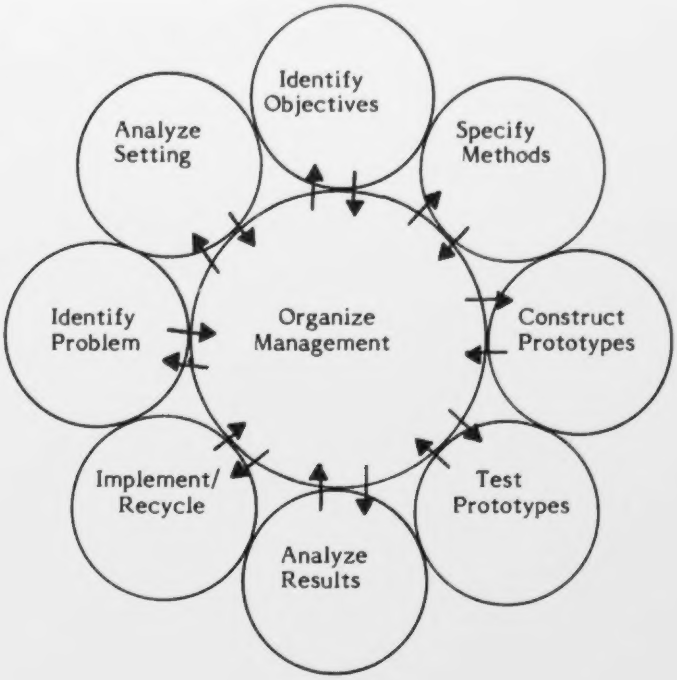

Identify Objectives
Specify Methods
Analyze Setting
Identify Problem
Organize Management
Construct Prototypes
Implement/ Recycle
Test Prototypes
Analyze Results

Figure 9-6. Venn diagram of a systems approach.

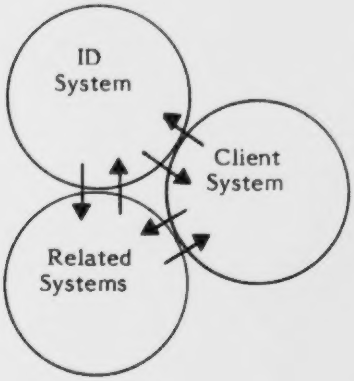

ID System
Client System
Related Systems

Figure 9-7. ID system interfacing with client and related systems.

resources are limited, interface analysis should be carefully considered. As a general rule, any time that a project represents a significant change in a system, it is wise to perform an interface analysis. That is, if the outcome fo a project can be expected to have a critical affect upon individuals within a system, then the acquisition of essential information in a useable form, at the appropriate time may well make the difference between acceptance and rejection for an ID project. Most instructional development requires people time as its major resource. Often, the large percentage of

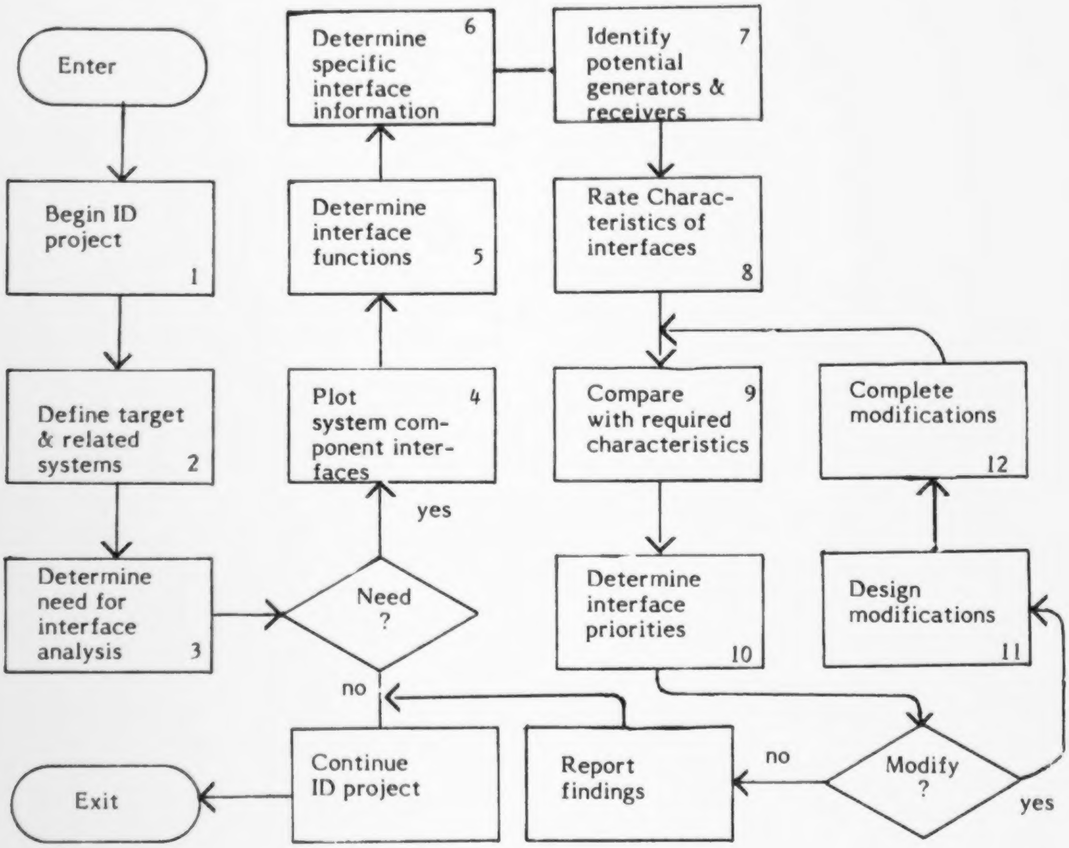

Enter
Begin ID project 1
Define target & related systems 2
Determine need for interface analysis 3
Need ?
yes
no
Plot system component interfaces 4
Determine interface functions 5
Determine specific interface information 6
Identify potential generators & receivers 7
Rate Characteristics of interfaces 8
Compare with required characteristics 9
Determine interface priorities 10
Modify ?
yes
no
Design modifications 11
Complete modifications 12
Report findings
Continue ID project
Exit

Figure 9-8. Iconographic model of interface analysis.

this time is available only in bits and pieces, because of other responsibilities of faculty involved in the instructional development project. The management of such fragmented time requires the collection and provision of much more information than in those cases in which the large percentage of a worker's time is dedicated to instructional development.

Given the identification of the system components in question and their function, specific interfaces can now be plotted, or identified. Graphically, these may be shown through Venn Diagrams as illustrated in Figure 9-6. This step (four) usually provides gross estimates of which boundaries should be considered. These interfaces are refined as the analyst specifies essential information required for the effective operation of the interacting components.

Given the state of the art, the determination of significant boundaries among subsystems and systems may be somewhat arbitrary. Usually, it is recommended that an analyst err in the direction of assuming that all components of a system or subsystem need to exchange essential information with one another. The relative importance of a particular interface surfaces in the next step of our model.

The fifth step in the model deals with function analysis. Given the clear identification of specific systems and subsystems, this process asks, "what are the major functions of each?" Knowing the specific functions that an interface is expected to carry out assists the analyst, in step six, to determine the specific information required to support these functions. The outcomes of step six are the most critical to a project's success. Here, decisions are made as to the minimally essential information required for the effective and efficient operation of the system and subsystem components. Emphasis is placed upon "minimally essential" information. Information is a commodity that costs resources, and rarely are sufficient resources allocated for this purpose. Therefore, the acquisition of "nice-to-know" and other information not directly related to the project, needs to be excluded.

In step seven, the individual responsibility within the various components of the system are examined in order to determine logically what position or person would most reasonably be expected to generate the essential information needed by the components, and to determine what position or person would be expected to apply this essential information. As discussed later, logic does not always dictate who will be generators and receivers of essential information.

The eighth step is concerned with categorizing the identified interfaces according to the general characteristics described earlier (permeability, selectivity, etc.). This process basically identifies what is, rather than what should be. This represents the first serious look at the actual conditions under which the information network within a system really works. The analyst is aware (at least logically) of what essential information is required and who the generators and receivers should be. It is most unusual to find a one-to-one match between the intended and the actual information-handling and communication network.

In the ninth step, the analyst attempts to determine the performance potential for each interface. This is accomplished by comparing the minimally essential information required with the current level of the general characteristics of the interface. This part of the analysis is expected to show that some of the existing interfaces are adequate for the project purposes while others are not. Beyond that, the findings indicate which elements of the interface need modification.

The final step in the interface analysis process is for the analyst to prioritize the defective interfaces in terms of their criticality to the ID project. This can relate to both effectiveness and efficiency. This is used by project administrators and those responsible for interface modification in order to make their decisions.

With this background description, the reader should be prepared to consider an actual example of interface analysis.

AN EXAMPLE OF INTERFACE ANALYSIS

The following sections describe an example of an interface analysis carried out for a college undergoing extensive programmatic change. Because of space considerations, it is an abstracted version, highlighting the key elements of the setting and the analysis. This analysis will follow the steps in the model presented in Figure 9-8.

The Setting

The client institution involved in this analysis is a college of education whose leadership has embarked on an instructional and organizational development project designed to make major changes in the undergraduate teacher education program. The intent is to move from one basic program, which provides all teacher education students with identical experiences, to several alternative programs, each with a different emphasis. The contention of those favoring the movement is that the existing program is attempting to be all things to all people, and that in the limited preparation time permitted, its students are getting training that is "a mile wide, but only an inch deep." Their thought is that, given the differences among experts on what the curriculum should be, and given the differences among school districts in what they and their respective communities believe, it is valid to provide teacher education students with choices among curricula.

Not every faculty member of the college agrees that alternative programs are needed, and some seriously question the financial feasibility of having alternative programs. One of the alternative programs is the current program. A sufficient number of faculty members feel strongly that this generalist approach is appropriate for some students, in some settings. The alternative program emphases suggested are: subject-matter, heterogeneous groups, educational generalist, community of learners, and classroom management.

Target and Related Systems

An early step for any instructional development project, whether doing an interface analysis or not, is to identify any systems which may affect, or be affected by, the project.

The major components or subsystems identified in the undergraduate teacher education programs (UTEP) are shown graphically in Figure 9-9. These six components are: faculty, students, curriculum, instructional facilities, field settings, and the teacher-education administration. The curri-

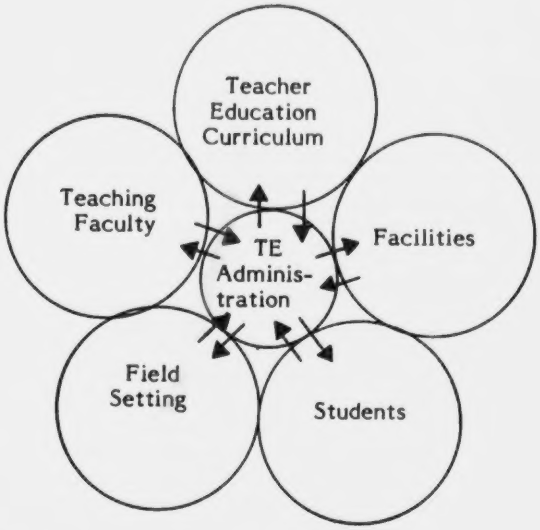


Figure 9-9. Undergraduate teacher education program.

culum is made up primarily of courses, including student teaching. The courses are taught by several departments, both in the college of education and in other colleges of the university. The curriculum for elementary education majors is somewhat different from that for secondary education majors. There are a large number of curricular areas in which students may earn minors.

Standard classrooms constitute most of the facilities required by the UTEP. In addition, there are self-instruction and curriculum production laboratories. The faculty, as in the case of the curriculum, are in several colleges. Elementary majors are responsible to the college of education, while secondary majors are responsible to the college in which their subject-matter curriculum is housed. Some courses, including student teaching, require field settings, which are mostly classrooms where students may go to practice and observe what they have been taught in the UTEP. The coordinating component, or teacher-education administration, is the responsibility of the director of the teacher-education division in the college of education. Since the diagram in Figure 9-9 is limited to two dimensions, it only indicates the exchange of information between the five outside components with the teacher education administration component. It does not show the interface between faculty and student components, for example. To show all of these interfaces in a two-dimensional space, it would be necessary to have six different graphs, with a different component in the center each time.

Figure 9-10 shows the relationship of the undergraduate teacher education program (UTEP) to its related systems. They, too, provide essential information without which the system's effectiveness and efficiency could be impaired.

The State Department of Education, at another level, is a major policy-making and standard-setting agency for teacher education programs. As a responsive agency, its policies and standards change. The exchange of information between it and teacher education institutions is critical. At the national level, UTEP must be concerned with accrediting agencies such as the National Council for Accreditation of Teacher Education (NCATE). NCATE evaluation teams now visit each teacher education program in the United States once every

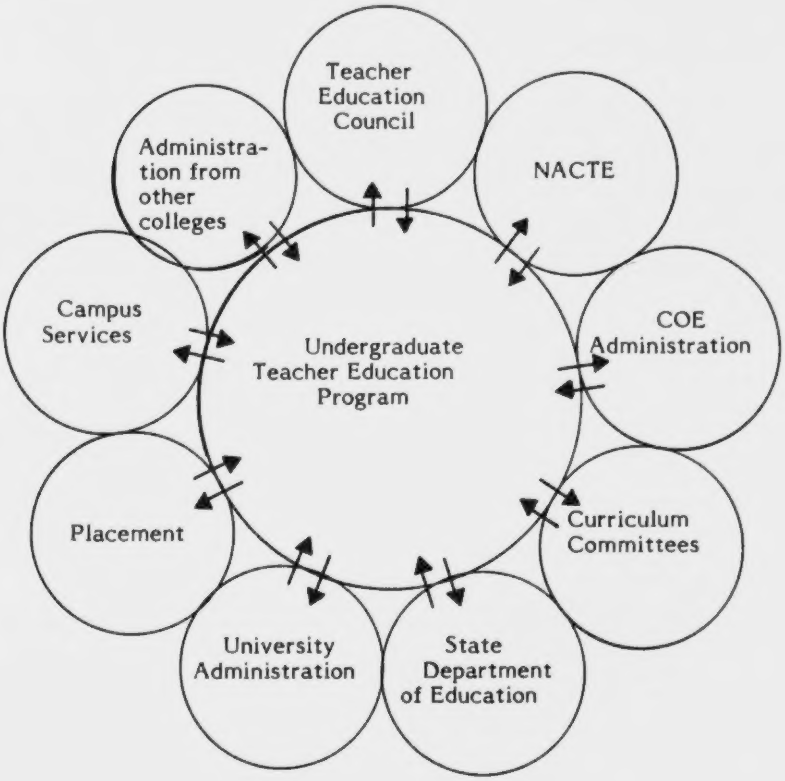

Teacher Education Council
NACTE
COE Administration
Curriculum Committees
State Department of Education
University Administration
Placement
Campus Services
Administration from other colleges
Undergraduate Teacher Education Program

Figure 9-10. Systems related to the target system.

seven years. A teacher education program that fails to meet the minimal standards for such programs has sanctions placed against it which can only be removed by correcting all deficiencies. While information is not exchanged with NCATE on a regular basis, the exchanges which are made may be critical. The university administration and the board of trustees are ultimately responsible for programs on campus. With that responsibility comes authority manifested as general policy, but whose resource-allocation decisions invariably require justifying information from its programs. While the College of Education has primary authority for teacher education programs at the college level, it shares that authority with the administrators of other colleges which also provide instruction for UTEP. The primary agency through which they express that authority is the Teacher Education Council (TEC). TEC serves as a monitoring group which also sets policy for UTEP. Departmental, college, and university curriculum committees are gates through which any programmatic change must pass. The Placement Office serves as a clearinghouse for employment opportunities for the graduates and assists in hawking program wares among competitive markets. Campus Services, another important and useful subsystem of the teacher education system, includes student counseling services, evaluation services, instructional material services, the book store, the library, computer services, printing services, dormitories, and so on.

Identifying these related systems and subsystems was accomplished through a number of techniques. Organization charts, university and college by-laws, and interviews with program administrators and faculty members were all common means.

Returning to the development of alternative teacher education programs (ATEP), it is necessary that a new (albeit temporary) system be designed, a program (instructional) development system. This system was installed to carry out the development of the alternative teacher education programs. Figure 9-11 breaks this system down into its most obvious subsystems. Five of the outside circles represent the instructional development teams, each responsible for one of the five alternative programs. The co-directors, two from each of the five alternative programs, make up the sixth component, the Alternative Program Team Co-directors. This component, along with the program development coordination component, represents the management aspect of the development process. Their mutual involvement is also designed to ensure that unnecessary duplication or gaps do not occur in the program.

If the related systems for the Alternative Teacher Education Program Development System are examined (Figure 9-12), it is seen that they are very similar to those of UTEP in Figure 9-10. This should not be too surprising, given that the alternative teacher education programs would be expected to be responsible to the same policies as the current program.

The diagrams presented in the preceding figures have provided a systems map of the domain that instructional developers must consider as they proceed with this project. It is a broad sweep, and

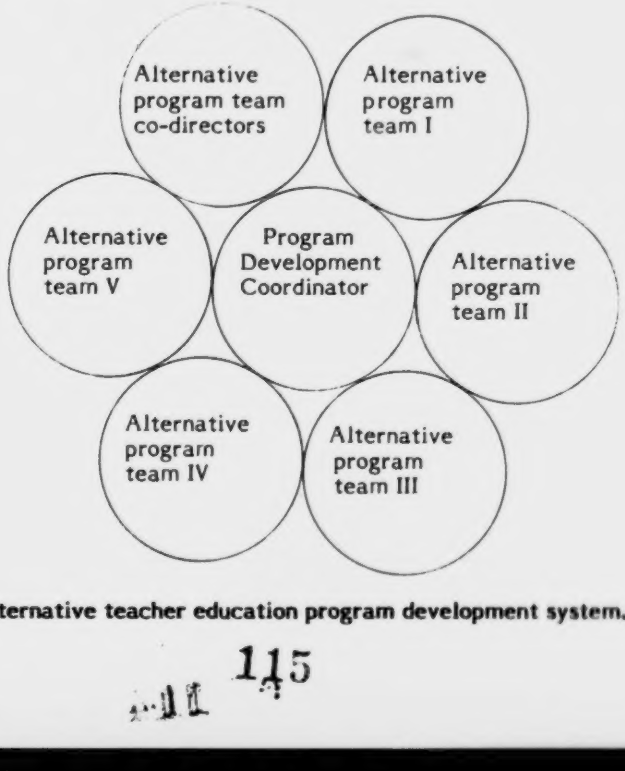
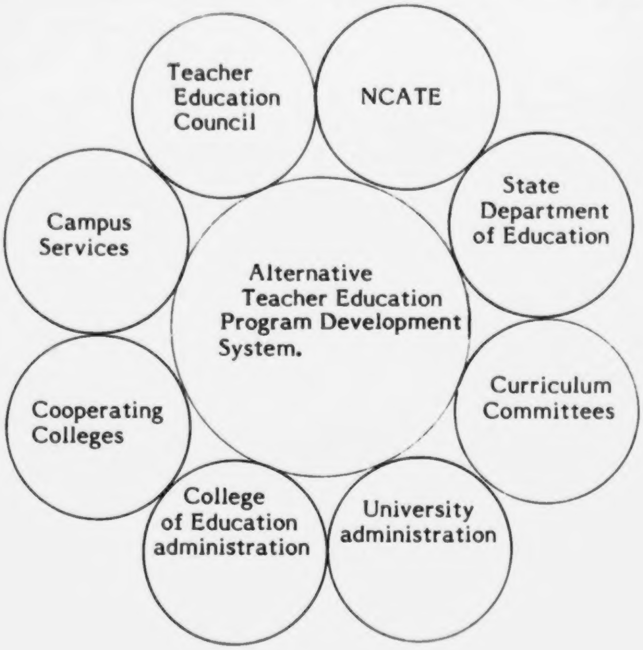

Alternative program team co-directors
Alternative program team I
Alternative program team V
Program Development Coordinator
Alternative program team II
Alternative program team IV
Alternative program team III

Figure 9-11. Alternative teacher education program development system.

Figure 9-12. Systems related to the alternative TE program development system.


Teacher Education Council
NCATE
Campus Services
State Department of Education
Alternative Teacher Education Program Development System.
Curriculum Committees
Cooperating Colleges
College of Education administration
University administration

only shows the lay of the land, but it is sufficient to permit developers to take the next step.

Need for Interface Analysis

Keeping in mind that the purpose of interface analysis is to systematically determine minimally-essential information required by the systems and subsystems involved in the development, we can ask if, in this particular case, an interface analysis is worth doing? Using the broad criteria mentioned earlier, it would appear that an interface analysis would be useful. The project is extensive, affecting a large number of individuals in the target and related systems, of whom a respectable number are not yet convinced of the value of the project. Also, the resource level for this development is minimal, requiring careful coordination of the time that faculty members and others have to give to the project. The management of fragmented time requires far more information in order to maintain development momentum than does management of dedicated time. Long delays, caused by a lack of information when it is needed, does much to reduce the enthusiasm of participating faculty.

Interface Plot

The plotting of interfaces is accomplished by expanding the Venn Diagrams in Figures 9-9, 9-10, 9-11, and 9-12 so that in each case the relationship of each component to all of the others is shown. For example if, in Figure 9-12, the middle component switched places with the university administrator component, then we would consider all possible combinations of information exchange between the university administration component and the other components making up the diagram.

Interface Functions

At this point, the interface analysis examines the functions of each pair of components as they related to the instructional or program development project. It is not necessary or efficient to consider every function each component might be responsible for, since many of their functions have little or no relevance to the project. In fact, in some cases the analyst will find it useful to only be concerned about selected data for a specific function. For example, the university administration functions of most concern are those of policy making and resource allocation. But the interface amalyst will only be interested in those policies and budget matters which may affect the project. The guiding question is, "what functions of this component could or should affect project outcomes?" To give one other example, the major curriculum committee function is to compare all course or program proposals with a set of established criteria, and to either accept or reject the proposal depending on how well it meets those criteria. In the case of this institution, there are four different committees through which curriculum proposals pass, all with somewhat different criteria for passage. Departmental, college and university by-laws usually spell out these functions quite clearly.

Minimally-Essential Information

The analyst now translates the component functions into a description of the "must have" information needed by other components of the project in order for them to do their tasks well, and determines what essential information that same component requires in order to best serve the needs of the project. To make this clearer, consider the curriculum function mentioned in the previous section--"to compare all course or program proposals with a set of established criteria, and to either accept or reject the proposal depending on how well it meets the criteria." What is the bare-bones information needed by the project from these curriculum committees? Below is a partial list of the items of information which the director of this project needs in order to interface effectively and efficiently with the curriculum committees:

1. course and program criteria considered important by the curriculum committees
2. procedures and forms for submitting proposals
3. level of detail required by the curriculum committees
4. contact person(s) on the curriculum committees
5. amount of lead time required by a committee to consider a proposal.
6. schedule of regular meetings of the committee
7. procedure for challenging a curriculum committee decision

In turn, the analyst determines the essential information needed by each of the four committees, and what components would be responsible for generating that information. Below are examples of information items expected by all of the committees, but on a different level for each:

1. assurance that necessary resources for developing and maintaining the system are available
2. advantages to the unit represented by particular curriculum committees
3. asssurance that territory of other unit members is not being pre-empted
4. experimental nature of the program
5. evidence that the program meets required criteria

Information Generators and Receivers

The next task of the interface analyst is to determine what individual or individuals would actually be expected to generate the essential information, and who would be expected to receive it (i.e., use it). A number of techniques are used to identify these individuals. For instance, examination of organizational structure and committee memberships, or directly asking unit members involved, were some of the methods used. In one situation, where it was critical to understand both the formal and informal communication network, a modified network analysis (Farace, Russell, and Monge, 1974) was performed. This is a powerful tool for very quickly identifying the operating communication network in a system, which invariably is dependent on informal elements as well as those designated by the system. This technique very rapidly identifies communication groups within the system, and of greater value to the instructional development project, it pinpoints who is dependent on whom for information. Often it is found that formally designated generators and receivers in a system are not the ones who do the work or handle the essential information. The technique also identifies liaisons and bridge links, individuals who for any number of reasons are in a position to best distribute information to several groups or individuals in the system, or, for that matter, to receive information from a number of sources. These individuals are valuable for other instructional development processes as well, such as assisting in the diffusion of innovations.

Interface Characteristics

It is necessary to identify the generators and receivers of essential information, since they are a critical part of the interface, before actually rating the characteristics of the interfaces. These characteristics are: permeability, selectivity, directionality, deprivation, visability, stability, dependency and capacity. They are described in an earlier section of this chapter.

The curriculum committee component in Figure 9-12 will be used to illustrate the rating of the characteristics of an interface. Two major factors determine the rating (in terms of effectiveness and efficiency) of the characteristics of a particular interface. These are the structural mode of communication used and the personal qualities of the generators and receivers of information. The formal and informal structural modes for communicating information are those means used by the interacting systems or subsystems for that purpose. In this project, the usual communication modes were used, including: face-to-face, memo, telephone, written reports, up to and including computer read-outs. These modes were looked at both in terms of effectiveness and efficiency. As examples, in those instances where records were needed, face-to-face or telephoning was not effective. The time-lag resulting from using campus or other mail systems for delivering memos or reports was found to reduce the efficiency of the instructional development. The personal qualities of generators and receivers that could affect the characteristics of the interfaces include attitudes toward the project and its personnel and the respective communications and information-handling skills of the generators and receivers. In terms of the latter, these skills (or the lack of them) affect the attributes of the information in terms of accuracy, completeness, relevancy, and timeliness (Hussain, 1973). In regard to attitudes, if receivers do not trust the source of the information, they often do not use it. By the same token, when the generator (or possessor) of the information views either the project or the receivers of the information antithetically, s/he is hesitant about sharing that information. It is not unusual in a project to discover that individuals needing the information (receivers) have worked out alternative ways to get the information, and ignore the formally established procedure. As often as not, the reason may be traced to a lack of trust in the generator of the information. S/he is perceived by the receiver as being negative toward the project, or toward the receiver, or even being incompetent. In other cases information is not used because it arrives too late or because it is

Figure 9-13. Sample rating report on characteristics of an interface.

Characteristic	Rating
1. Permeability	I
a. information required would necessitate a change in their computer program.	
b. They don't want to make the change out of concern for having to provide the same service for others.	
2. Selectivity	I
a. They are concerned that they may be liable to privacy laws, if they give us the information.	
b. They were not able to show the section of the privacy law that legislated against their providing this information.	
3. Directionality	I
a. Their practice has been to send out information that they see as valuable, rather than to respond to requests.	
4. Deprivation	S
5. Visibility	S
6. Stability	S
7. Dependency	I
a. It is very necessary to identify these students.	
b. The information will continue to be needed on a regular basis, even after development is complete.	
c. The assistant director is sympathetic to the need.	
8. Capacity	S

provided in an unfamiliar or inappropriate format. Even when care is taken, these problems often do not surface until sometime later, when those responsible for the instructional development are trouble-shooting project slowdowns. Eventually, it becomes necessary to set up a monitoring system that periodically checks the level of the characteristics for an interface.

The rating scale used for each of the characteristics is relatively primitive. An "S" indicates that a particular interface characteristic is at a sufficient level, and an "I" is used when the characteristics falls below the desired level. Accompanying the "I" is an explanation of why the interface falls below the desired level. Figure 9-13 is a sample of an interface rating. Note that four of the characteristics are rated "insufficient," while the rest are rated "sufficient." There is an attempt to keep the explanation for these deficit characteristics factual, and to avoid offering solutions.

Comparisons

In Step 9 of the Interface Analysis Model, the analyst assesses the capability of each interface (in its present state) to provide the necessary information at the desired level of effectiveness and efficiency. In the case of the example provided in Figure 9-13, extensive modification is required before it can perform satisfactorily. Considering the list of defective interfaces only, there is considerable variance in the amount of modification required for each. On the positive side, the larger number of the desired interfaces for the system are already in place, and are rated as satisfactory for project purposes without change.

Interface Priorities

This step is limited to considering only the interfaces which require modification. Some of the proposed modifications require extensive resources (in a system where resources are difficult to come by), and completion of them is projected to consume a great deal of time. The amount of resources and time required in such projects is often difficult to predict. In most cases, the analyst simply gets agreement from significant others on the strategy most likely to be used in changing the interface, and then provides resource and time estimates for that strategy. In addition, the interfaces are ranked in terms of their importance to the project. In a sense this final ranking is a final test of the analyst's conviction that the information identified is the "minimally essential information" required to do the job.

Step Ten ends the interface analysis part of the process. The data from this analysis is then used by decision-makers to decide whether to modify, or how much to modify, a given interface. In a few instances, project leaders may decide to develop entirely new or parallel interfaces. In the case of the interface in Figure 9-13, the necessary modifications will eventually be made, but at a cost of considerable energy and time.

CONCLUSION

Some form of interface analysis has always been used by instructional developers, whether they called it that or not. The question remaining is whether the systematic analysis of interfaces among system and subsystem components is a valid way for determining, in a proactive way, the essential information required to carry out instructional development. Few disagree about its value on a logical basis, and those taking part in the limited application of models such as the prototype described here indicate a savings in energy and time. However, the value of interface analysis toward solving an ancient system's problem will not be determined until its processes has been refined and objectively tested in a broader range of settings.

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III. TACTICS

III. TACTICS

The section called "Tactics" deals with matters involved with the actual implementation of those decisions discussed in the section called "Strategies." Once an overall plan for attacking a problem has been formulated, how is it to be carried out? How are the questions which arise on a day-to-day basis to be answered? The present section discusses those matters involved in the nitty-gritty work of actually carrying out an instructional development plan; not all such matters, but at least a large number of them.

This section is composed of three subsections. The first of these deals with the theoretical basis of various instructional design models (as opposed to instructional development models, covered in the section on strategies). The second subsection discusses various designs themselves. The third subsection discusses relationships between the client and the developer.

The first subsection consists of four chapters. Chapter 10 discusses the current status of human information processing and relates this to message design and other aspects of instructional development. Chapter 11 discusses current findings in cognitive processing and relates this to instructional design. Chapter 12 relates recent findings concerning split-brain functions and the triune brain to the design of instruction. Chapter 13 provides an alternative to Bloom's taxonomy within the context of cognitive psychology.

The second subsection consists of seven chapters discussing various instructional designs. Chapter 14 examines the current status of programmed instruction. Chapter 15 describes the feedback lecture, and provides an example of the use of guided design. The research concerning the design of textual materials is examined Chapter 16. Learner control is explained in Chapter 17, and the research literature concerning it is examined. A new approach to educational development called "student development" is examined in Chapter 18. The design and use of a particular kind of game in the educational setting is presented in Chapter 19. The final chapter of this subsection, Chapter 20, presents our current knowledge concerning the design and use of advance organizers.

The third subsection treats the relationship between the developer or development team and the client. Chapter 21 presents a conceptual framework for approaching this aspect of the development system. Chapter 22 discusses some research and experience related to the initial meeting between the developer and the client. Chapter 23 presents a third viewpoint on this important aspect of development. When an instructional development project fails, it almost always does so for one of two reasons: Either inadequate attention has been given to the diffusion-adoption process, to be discussed later, or the client-developer relationship has been allowed to fail. Thus, this subsection can serve an important role if it succeeds in doing nothing but making us aware of the problem.

These three subsections, taken together, provide the basis for the daily decisions which must be made as an instructional development project proceeds. Again, these tactics can be used within almost any of the philosophical frameworks and instructional development strategies presented earlier. Therefore, if one considers the implications of each of the possible combinations, a considerable amount of information should be revealed concerning how to conduct instructional development.

A. Basis of Design in Theory

10. Human Information Processing. Robert M. W. Travers.
11. Knowledge and Its Acquisition: An Introduction and Overview. Buford E. Wilson.
12. Split-Brain Theory and Recent Results in Brain Research: Implications for the Design of Instruction. James D. Hand.
13. Cognitive Theory Within the Framework of an Information Processing Model and Learning Hierarchy: Viable Alternative to the Bloom-Mager System. Robert J. Stahl.

B. Designs

14. Programmed Instruction to Computer-Based Instruction: The Evolution of an Instructional Technology. Joseph P. Lamos
15. Designing an Alternative Teaching Approach (Feedback Lecture) Through the Use of Guided Decision-Making. Dean Osterman.
16. Developing Textual Materials: What Research Says to Practitioners. Keith J. Thomas, Robert J. Stahl, and Charlene C. Swanson.
17. Learner Control. M. David Merrill.
18. Student Development: The Next Logical Focus. James D. Hand.
19. Frame Games and Game Chains: A Technology for Interactive Teaching/Learning. Harold D. Stolovitch.
20. Advanced Organizers: Their construction and Use in Instructional Development. John Newell.

C. Client-Developer Relations

21. Psychological Typologies and the Dynamics of the Consultant Relationship. William C. Coscarelli and Jerry K. Stonewater.
22. The Initial Client Conference - Implications for Continuing Relationship. Robert D. Price.
23. Consultation in Instructional Development: A First Look. David P. Rutt.

A. BASIS OF DESIGN IN THEORY

Chapter 10

Human Information Processing

Robert M.W. Travers

Instructional developers typically produce audiovisual materials, or at least design them. When IDers don't do this they often specify their use within instructional sequences. Therefore IDers need to understand how learners process these materials as they learn, or fail to learn, from them. This chapter examines what we know about this process.

SCOPE AND LIMITATIONS OF THE CHAPTER

The last few decades have seen the production of a vast literature on human information processing that can be summarized here in only the sketchiest fashion. Contributions to this area come from neurophysiology, computer science, cognitive psychology, epistemology, mathematical information theory, electronic modeling, genetics, and other branches of knowledge. The sketch of human information processing provided here draws upon many sources, some of which are listed in the final section on "Sources." The broad scope of the chapter does not permit detailed documentation; the reader who wishes to pursue the subject further is referred to works which give broad coverage and, in turn, will provide references at a still more detailed level.

The limited length of the chapter restricts coverage not only to rather broad generalizations, but also has required the omission of certain topics. The very significant research on memory of the past 15 years has been largely ignored. Information processing, though always related to memory, is viewed largely as an intake process with little consideration of how memory and memorized information is structured.

APPROACHES TO THE STUDY OF HUMAN BEHAVIOR

Human behavior can be viewed in many different ways by scientists with different backgrounds. Those who come to psychology with a background in physiology and biology are likely to be impressed with the physical similarity between the human organism and organisms rather lower on the evolutionary scale. These psychologists have typically taken the position that human behavior is similar to animal behavior. Such a theory generally implies that human behavior involves the same basic components as animal behavior. Those who have approached behavior with such a viewpoint during the last half century have typically taken the view that the basic components of behavior involve some form of conditioned response. Complex behaviors are then assumed to be chains of conditioned responses. Conditioning theory has emerged in many forms during the last 100 years. Its main proponents at the present time are followers of Pavlov and Luria in Russia and the followers of Skinner in the United States. The modern version of conditioning theory conforms very closely to the associationistic theory of Western civilization.

Another way of viewing human behavior is to see it as a rational, logical system. This viewpoint has slowly emerged into a position of prominence in recent years through the work of Jean Piaget and his followers. It is a revival of the classical Greek view of human nature, and derives its modern support from the fact that many of the great achievements of humanity seem to be linked to the human capacity for logical thought and the understanding of such logical relations as those of implication.

A whole volume could be devoted to a discussion of the various ways in which human behavior can be productively viewed, but the examples given thus far are sufficient to show that there are diverse productive ways. Our own era on the American Continent has generated its own special way of looking at human behavior, and that is to view the human as an information-processing system. This view seems to reflect the trend in thought appropriate to a computer age, in which much of society is controlled by the information systems provided by computers. These devices are, in a sense, extensions of the human intellect, performing very effectively many activities that humans already do rather well. The computer, designed in the image of the human intellect, has thus become, for some, a model and representation of that intellect, and has provided an image of how the human intellect functions. The human is, of course, much more than an information-processing system, just as the human is also much more than a collection of conditioned responses, or a conglomerate of logically-related behavior. Each way of looking at the human has limitations, but each way may still have utility. In this chapter, an attempt will be made to explore the view of the human as an information-processing system and to draw together some of the implications of knowledge in this field.

PERCEPTION AS INFORMATION PROCESSING

For more than a century psychologists have had an interest in one particular aspect of information processing, called perception. This area of inquiry has involved studies of how the sense organs receive information and the nature of the experiences that accompany stimulation of the sense organs. Classical perception theory, developed in the earlier part of the century, took the position that perception was an inactive process. This inactive view was partly a result of a failure to recognize that memory necessarily plays a crucial role in perception, and also a failure to note that perceptual activities involve a great amount of activity on the part of the entire organism. All creatures that have the capability of movement are active explorers of their environment and actively reach out into their environment. The organism is not a passive creature waiting for perception to leave impressions upon its memory systems, but engages in a continuous search of the environment for that which is relevant to survival.

The transition to the view of perception as an active searching process came largely through the work of J. J. Gibson, who recognized that each sensory system has coupled with it a musculature that permitted the system to play far more than a passive role. Thus the eyes not only have built into them sets of muscles which will turn them through at least 90° in each of two planes, but movements of the head can also redirect the direction of gaze. Furthermore, the infant's eyes are not passively fixed until an object attracts the infant's attention, but the eyes scan the environment in a searching type of motion that continues until the infant finds a light or a boundary that attracts attention. The eyes of the infant, from the first few days after birth, search for sources of information that can be assimilated.

Gibson wrote of perception as organized around five different systems. These he referred to as the visual, auditory, taste-smell, haptic, and orienting systems. The haptic system involved both the touch and related systems in the skin and also the sensory systems deep in the muscles that permit the individual to know the positions of the various parts of the body. The orienting system is that associated with the inner ear and which has to do with body balance and the keeping of the body upright in the gravity field.

Traditional forms of instruction violated the way in which the perceptual systems operate. Often a class of children were required to sit upright and keep their eyes fixed upon a teacher seated at a desk. The children were expected to inhibit the natural roving of the eyes that are native to the human visual perceptual system. Indeed, perceptual exploration of any kind was forbidden. Classes run along such lines are still seen today and, in fact, there are some such programs of instruction that are marketed at the lower elementary grades. These programs treat the human perceptual systems as though they were static and simply waiting for knowledge to be poured into vacant minds from the mouth of an all-wise teacher. The native perceptual mechanisms do not fit teacher-centered theories of instruction very well. Such theories deny the learner the opportunity to acquire knowledge through the mechanisms that have evolved for this purpose.

The objection raised here to the eyes-front, regimented type of instructional program should not be taken to imply that learning should occur without discipline. Learning through active exploration through perceptual systems has to become progressively more disciplined as age advances, but it is not the eyes-front, sit-still kind of discipline that is of value. What is needed is the discipline which involves progressively more systematic, active, exploration of objects and events of interest, that progressively becomes guided by logic. The ultimate development of this systematic and disciplined exploration is found in the work of the scientist.

THE MEMORY-PERCEPTION INFORMATION-PROCESSING MODEL

The psychology of the early part of the century viewed perception and memory as quite distinct functions. The distinction comes from philosophers, particularly of the British Empiricist School, who did not understand the vital relationship between perception and memory. In order to understand this relationship, let us consider a mechanical or electronic device that is designed to recognize simple geometrical forms and to tell us what they are.

Let us suppose that this device consists of a perceptual system that scans whatever is in front of it and that it has some kind of memory system. Let us suppose that the outline of a square is placed in front of the device. The machine now has to tell us what it sees. In order for it to do this, the machine must have some information stored in memory that will enable it to make the decision. A machine that had no storage of information, and merely recorded on a photographic plate what it "saw", could never tell us what is was seeing; but our device is designed so that what it perceives influences what it does, just as the action of the human is related to what the human does.

The memory of our device could be built in a number of ways. It could have recorded in its memory geometrical shapes of various forms and sizes, and the input could be matched with what was stored. If the best match was with a square, then the device would tell us that it was viewing a square. Other forms of storage would also permit the device to tell us what it was viewing. The memory might be designed so that it recorded the attributes of geometrical figures, such as straight lines, curved lines, angles, and the number of each kind of components. With such a memory, the device might tell us that any 4-sided figure was a square, much as a 4-year-old child might well do. For the device to do better than that, it would have to be able to use information either about the equality of the internal angles, or the equality of the sides of the figures, or some other equivalent relation.

The point to note is that information is meaningful and useable only in so far as the related memory system has stored in it some information that makes the interpretation of the inputs possible. Also, the system has to have mechanisms which permit the analysis of the inputs in ways that the memory can understand. Thus, if our device had a memory that permitted it to recognize geometrical figures in terms of the properties of their component lines, the device would also have to have a perceptual system that analyzed the information presented to it in terms of lines and their components. The analysis mechanism of the perceptual system has to be compatible with the memory system.

The discussion to this point is not fantasy, for much has been learned about human information processing through attempts to develop tasks that will perform human-like acts. These tasks show, very clearly, the intimate relationship between perception and memory, and the compatibility that must exist between the information-analyzer mechanisms and what is stored in memory. An infant, in the first weeks of life, who gazes at a dark line on the ceiling and shows, through the movement of its eyes, that the line is being scanned from end to end, is also showing that it has a perceptual mechanism that permits it to discriminate lines from other visual displays, and that it has some memory mechanism which permits it to see lines in some way as meaningful objects. Without such inherent mechanisms in both perception and memory, the infant could not even begin to learn about its complex environment. The mechanisms that are built into the nervous system permit the very young infant to begin exploring very simple aspects of a complex world.

Computers have been built to be extensions of the human intellect. They have been designed to undertake some of the kinds of tasks that humans do rather well, but they can perform many of those tasks with vastly greater speed and accuracy than can humans. Computers can be viewed as simulations of the human intellect. Such attempts to simulate the human intellect provide a means for exploring the nature of human intelligence. The computer is very much like a very large piece of paper on which one can draw what one believes to be the essence of human thought and human information processing and storage, but unlike a drawing on a piece of paper, the computer allows one to find out whether the computer, designed in the image of the human, can behave in human-like ways.

These activities related to the computer have generated an enormous amount of interest in the human as an information-processing system. The view of the human as an information-processing system fits well the intellectual interests of our age.

THE EMERGING VIEW OF THE HUMAN AS AN INFORMATION-PROCESSING SYSTEM

The traditional view of the human perceptual system and of the memory system was that it began, at birth, like a blank slate upon which nothing had, as yet, been written. This was the "tabula rasa" of John Locke, for whom knowledge was imprinted on the mind much as an image is imprinted on a photographic film. From that point of view, perception and memory were passive processes. A passive memory recorded whatever the perceptual system happened to transmit to memory. This viewpoint implies that the memory system of the brain is not in any way pre-wired, but that the recording of information in memory slowly establishes a wiring system, through which the information is retained.

There are many difficulties with this representation of perception and memory that make it quite untenable. A first and major difficulty is that a single look at the world with the eye contains more information than the nervous system can record. All the details, imprinted momentarily on the retina, involve an immense amount of information, and most of it of quite a trivial nature. If the information involved in the infant's first view of the world were recorded in the infant's memory, then the entire storage capacity of the entire system would have been used up. Obviously this does not happen. Information is recorded selectively. Only a very small part of what the infant sees is ever recorded in the infant's memory, and the same is true of an adult. All of us see much, but record only a tiny fraction of that information. From the earliest days of infancy, each of us is highly selective in what is recorded in memory.

Selectivity in what is recorded in memory implies a special relationship between memory and perception. The human memory system appears to be so designed that it is selective in what it will record. Most of what the infant sees is not recorded, because the memory system is not equipped to record it at the time of exposure. The behavior of the infant shows that the visual perceptual-memory system of the infant is well equipped to record certain types of information. For example, the eyes of the infant, in the first few weeks of life, will follow a line or boundary from one end to the other. If there is an intersection of the line or boundary with another line or boundary, then the eyes of the infant will stop and fixate intently upon the intersection. The eyes of the infant seem to be programmed to study the boundaries of objects, and to record information about boundaries.

This tendency of the infant to study the boundaries of objects reflects a basic strategy of the perceptual-memory system for extracting data from the environment. The boundaries of objects are critical pieces of information, not only in the identification of the objects, but also in relating to those objects. The infant can grasp an object if the infant understands where the boundaries of the object are. The importance of the boundaries of objects is reflected in the fact that one can draw an excellent representation of virtually any object by using a pen to sketch the boundaries. Such line drawings are easily recognized, not only by humans, but by other primates, who easily recognize line drawings of common objects. The human information system seems to have a special propensity for picking up boundaries and lines.

Although modern psychologists have been reluctant to concede that the human information-processing system has any inherent capacities for processing information, much of what the infant does implies the existence of such a capacity. The attention to lines and their intersections is one example. Another more controversial one is the reaction to the human voice and the human face. Infants have been described as socially-precocious creatures. They attend to the human face from the earliest days after birth. One of the remarkable performances of very young infants, in the first few weeks of life, is that of imitating the protrusion of the tongue of the caretaker. This feat is remarkable in that the infant has never seen his own tongue, and can hardly have discovered that he has a tongue similar to that of his caretaker. This behavior implies that the infant has some inherent comprehension that the head of the caretaker has components similar to that of his own head, and that he can do with those components what the caretaker does with the caretaker's components. Oddly enough, the capacity to imitate this act disappears after the first few weeks and does not reappear for many months.

A more controversial area is that of speech comprehension. There is quite general agreement that the infant is well oriented towards human speech from birth, and works on cracking the code involved. Some speech experts go so far as to take the position that infants are born with a general system of grammar built into their nervous systems, which forms the basis for cracking the speech code of the language to which they are exposed. Authorities disagree upon the extent to which the infant is programmed with a set of rules which enable it to slowly decode the speech to which it is exposed. As a minimum, the infant has to have some understanding that speech has some kind of structure, if the structure can only be found. An infant thus internally programmed would search for structure, but the understanding of speech involved far more than a mere understanding of structure, for the infant has to search out the situations in which speech is used and must discover for what results it is employed. The innate social dispositions and understandings of the infant may quickly link speech to social activity. The point to note is that every aspect of the development of language understanding requires that there be something recorded in the nervous system, in memory if one likes to use the term, that is essential as a foundation for developing understanding.

Although it is not known precisely the kinds of programs for guiding perception that are stored in the memory of the infant, and particularly for guiding the perception of the visual world and the world of speech, great progress has been made in identifying these programs in recent years. Without these programs the meaningful exploration of the world could never begin, and they are the foundation upon which all later knowledge necessarily grows. As that knowledge grows there are ever-expanding horizons of what can be perceptually understood. The exploration of how knowledge begins in the human has involved the revival of the idea, developed by the philosopher Immanuel Kant, that the child is born with a fundamental capacity for organizing information about the fundamental properties of the environment. These properties are those of space, time, the permanency of objects, and causation. Kant referred to these as the categories of experience.

Much of the research today on the development of perception shows the obvious imprint of Kant's ideas. Although the work of Jean Piaget did much to revive the Kantian view of perception, Piaget himself has been rejecting of suggestions that any aspect of behavior has an innate basis, with perhaps the exception of reflexive behavior. Nevertheless, much modern research, and notably that of Bower and his associates at the University of Edinburgh, have supported the position that at least the category of space has an innate basis.

There is no question that the infant's perception of the world is not as William James suggested, a "blooming, buzzing confusion." The evidence suggests that the infant sees objects in a spatial context, though in a much more primitive way than does the adult. There is also evidence to suggest that the infant is born with a native concept of the unity of space, and that the space involved in vision is the same space as is involved in locating sounds in space. Furthermore, the infant's response to colors is very much like that of the adult in that the infant seems to categorize colors into the common categories of the adult world. The perception of the infant is far more sophisticatd than earlier workers thought it to be. The research workers of earlier decades did not realize how sophisticated the apparently naive infant actually is.

Thus the human seems to be born with a perceptual system that will interpret the environment in a particular way. The perceptual systems are not the highly flexible systems that they were thought to be a generation ago. The knowledge that can be gained from our environment is highly restricted to the knowledge that our perceptual systems permit us to have, and we are correspondingly limited in the knowledge we can acquire about our environment.

The views presented in previous paragraphs suggest that there is great uniformity in how individuals process information. Our information systems are built around a capability for developing knowledge about the fundamental properties of the environment that must be mastered if an adaptive relationship to that environment is to be developed.

The point has been made that the perceptual systems have associated with them analyzer mechanisms which must be compatible with the memory system. Components of the analyzer mechanism involved in perception, together with some aspects of memory, are functioning shortly after birth, but there are others that seem to require stimulation for them to develop normally. One basis for the latter statement is the research which has been undertaken on the lazy-eye phenomenon. If one of the eyes of the child does not function well, then it may gradually lose its utility. Now the interesting feature of the phenomenon is that the eye itself does not degenerate. What happens is that a component of the information-analyzer mechanism in the central nervous system fails to develop properly. The neural mechanisms related to vision require stimulation for full development. The eye that is not used does not provide the stimulation necessary for the development of the corresponding neural mechanisms. The treatment of the condition, when it is found in early childhood, is simple. All that has to be done is to cover up the good eye and to make the poor eye do the work. The phenomenon has been studied in the cat, which has a visual mechanism very similar to that of the human. An eye of a kitten can be closed at birth and then, later, when the kitten has become a mature cat, one can test the ability of the cat to use the eye. One can show that not only has the cat the ability to use the eye but that parts of the visual tract have failed to develop. Through such studies one can show that the lazy-eye phenomenon is not a result of eye deterioration, but is a result of the failure of the neural-analyzer mechanism to develop.

The lazy-eye problem raises many interesting questions about how much stimulation of the nervous system is necessary for full development, and what kinds of stimulation are necessary. In a sense, the lazy eye is stimulated as much as the good eye in the untreated child, in that both eyes receive as much light and images are produced in each. Much more than simple stimulation is involved. For the lazy eye to develop properly, not only must there be images falling on the retina, but an effort must be made to use the information in some way. The phenomenon is not produced by an absence of images alone; the images have to be properly focussed, and perhaps may have to be used as sources of reactions, if they are to function in developing the visual analysis system.

THE PRIMACY OF VISION IN THE CONTROL OF HUMAN BEHAVIOR

There is mounting evidence that vision, in the case of the human, plays a role of special importance in the control of behavior. The strongest evidence for this comes from the study of babies who are born blind. These infants show an extraordinary inability to explore the environment. They will not reach out for objects that make sounds, and it is very difficult to stimulate these infants in such a way that they will undertake any kind of exploration of their environment. Although one is tempted to explain their behavior as a result of a fear of a world they cannot perceive, this does not seem to be the correct explanation. In the case of the infant with some vision, it appears to be vision itself that is the chief condition that makes the infant explore the world. Vision is the source of the stimuli that result in environmental exploration.

The dependency of the human upon vision for action is a feature shared by most higher animals derived from tree-climbing ancestors. A tree-climbing animal is dependent upon vision in a way that the animal tied to the ground is not. Most animals that live on the ground, and that have no capacity for climbing trees, have quite limited vision. Thus the wolf has limited use of vision, and locates most of its prey by means of smell. Vision is of importance only to those animals that can see the world at a great distance, and the vision of the human permits a direct orientation to distant objects. In addition, the human is equipped with color vision, an important characteristic of arboreal creatures, in that it permits them to discriminate ripe from unripe fruit, also seen at a distance.

Many books on perception of 10 or more years ago took the position that touch was the dominant perceptual system of the infant, and that explorations of the world through touch came to educate the sense of vision. The evidence accumulated since then tends to show that the reverse occurs, and that vision is dominant over touch. Many experiments have been undertaken in which there is a discrepancy between what is experienced through touch, that is to say through the haptic system, and what is seen. In all such experiments, where there is a conflict in the data provided by the two perceptual systems, the visual information is likely to take over and guide action. The dominance of visual information is very striking in all the experiments that have been undertaken.

PICTORIAL VS. VERBAL MEMORY

There is also another line of evidence that suggests the particularly powerful role of the normal perception of natural objects in relation to the perception-memory process. When the same inforamtion is learned in a pictorial form and in the form of spoken or printed words, the pictorial form is remembered far more easily than the verbal form. The difference is very striking, but the basis for it is difficult to understand. This does not mean that the visual system imprints information on memory better than does the auditory system, for the difference does not appear when a comparison is made between the learning of words presented auditorially and the same words presented visually in a print form, though some individuals do learn better through the one modality rather than through the other. In order to begin to understand the difference between the pictorial task and the verbal task, one has to note that the picture of an object, such as a shoe, includes a wealth of detail that is not present in the printed or the spoken forms of the word "shoe." When the picture of a shoe is presented for a few seconds, the viewer may take in as much information as can be taken in during the brief exposure. During a five-second exposure a person may recognize that the object presented is a shoe, and even classify the shoe into a smaller set of shoes such as gym shoes, dress shoes, or running shoes. Much of the detail will still escape the viewer, but another five seconds of exposure will permit the absorption of still more information, and each additional exposure of five seconds will permit the assimilation of further information. The same is not true of the exposure to the printed or auditorially-presented word. When the word is presented auditorially for a second or third time, some additional information will be recorded, such as whether the voice was high or low pitched, and whether one syllable was emphasized rather than another, but the additional information is trivial and has nothing to do with the nature of the shoe. A picture permits the viewer to undertake an almost endless task of taking in more and more information, but the corresponding verbal task does not.

One can remake the verbal task in such a way that it is more like that of the pictorial task. The verbal task then becomes more than simply perceiving the repetition of a single word, and involves a phrase such as "A leather dress shoe." Just as a second presentation of the picture permits the taking in of more information, so the second presentation might read "The shoe has laces and a smooth leather upper." Further presentations could elaborate upon the details of the shoe and permit the reader to elaborate his idea of the particular shoe in much the same way as the viewer of a picture slowly elaborates his idea of what is in the picture. One wonders whether retention of the pictorial material would be different from that of the verbal material under these conditions.

CAPACITY OF THE INFORMATION SYSTEM

The environment provides enormous amounts of information, and all organisms are remarkably built so that they can extract from this morass of information that which is important for survival. The process of extracting the vital information begins at the sense organs, and ends at the highest level of the nervous system. One cannot speak easily on the information capacity of the total system in that the capacity is different at different levels. For example, the eye has an enormous capacity for handling information at the level of the retina, but the highest level of the nervous system that handles visual information has a very limited capacity for handling information. The different perceptual systems also have very different capacities for handling information. The primitive taste-smell system is a very low-capacity system. The auditory sensory mechanism has a higher capacity than does the smell-taste system, but its capacity is not as great as that of the visual system.

Information analysis begins at the sense-organ levels. The eye is clearly structured to provide an analysis of visual information in terms of color components. Through a physiological mechanism, known as lateral inhibition, the retina itself seems capable of emphasizing the boundaries of objects, at those points where there is maximum contrast of light and shadow. Some organisms undertake a quite complex analysis of visual information at the retina level. Thus the retina of the frog seems to be able to identify, at the retinal level, small objects which have a particular form and motion. Whether the human retina can undertake such complex forms of information analysis at the retinal level is unknown. The methods used to study the retina of the frog cannot be used to study the retina of the human.

At each level of the nervous system some analysis of information is undertaken, and this analysis reduces the amount of information with which the next higher level of the nervous system has to cope. The result of this is that a certain kind of filtering takes place as information is transmitted from the sense organ level to the highest levels of the nervous system.

The information capacity of the highest levels of the nervous system is an indicator of how much can be attended to at any one time. The prevailing view is that the information capacity of each of the perceptual systems is the same. The capacity of the highest levels is still a matter for controversy. Some have argued, for example, that to comprehend a symphony requires an information capacity of about 100 bits per second. However, one should be hesitant in concluding that the information capacity of the information system of the auditory system, at the highest level, is about 100 bits per second, because listening to a symphony may not involve listening to every aspect of it every instant of the time. Indeed, the first time that one hears a particular symphony one may understand it only to a very limited degree. Even an experienced conductor will want to study the score of a new symphony he has never heard, before exposing himself to the music as it is played. After hearing a symphony many times, one may listen for particular features of it, knowing all the while that the rest of the symphony is there, even though one may not be hearing it at the time. Listening to a symphony, at a sophisticated level, may involve attention to first one aspect, and then to another aspect of it. In so far as attention is restricted, it does not call for the information capacity that a mathematician's calculations might indicate the act of listening to a symphony might require.

A distinction must be made between the information capacity of a system for handling a continuing flow of new information, and the information capacity of a system for handling information received during a particular presentation. The former would be estimated in bits per second and the latter in bits.

One cannot be very specific at this time in estimating the information capacity. One can say that the retina has a capacity for handling information in the millions, if not billions, of bits per second, and that the highest levels of the nervous system have corresponding capacities of less than 100 bits per second. A central educational problem is how to ensure the reduction in information in such a way that the relevant information reaches the highest levels. One suspects that, all too often, the trivial information is that which reaches the highest levels of the nervous system.

An important problem in the development of instructional materials is that of guiding the perceptual process in such a way that the highest levels of the nervous system select, from the mass of information presented, the small fraction of the information that is of crucial importance in the particular context. The task is like that of the prospector panning gold from a stream. From the handful of silt that is placed in the pan, only a small residue of gold will remain after the washing and panning process has been completed. There are many ways in which the designer of instructional materials can do this.

One obvious way is to present information in a form that contaminates it the least with irrelevant information. Line drawings and simple diagrams are attempts to do just that. Word descriptions can be pared down to essentials in order to facilitate communication. Sometimes an actual experiment with physical materials can demonstrate a phenomenon under simplified circumstances. For example, one can actually show with rods of real materials how heat produces expansion. In such a demonstration, there is no doubt in the learner's mind about the relevant features of the demonstration which must be attended to. Before field trips are taken, the teacher can orient the pupils on precisely the conditions that should be attended to and observed. If the latter is not done, the pupils will return from the field trip with miscellaneous information, much of it of a trivial character.

Every teacher has the experience of showing a film and at being surprised that the children did not grasp the main points that the film was designed to bring out. The problem is that the film typically presents millions of bits of information, from which each member of the class extracts some small amount of what that individual conceives to be the relevant information for retention. All too often the teacher simply does not understand how children, all of whom see the same film, can possibly learn such a diversity of facts, many of which are wholly irrelevant to the idea that the film was designed to present. This difficulty can be prevented through orienting the pupils, prior to the showing of the motion picture, concerning the relevant pieces of information to look for. This orienting process provides decisions for the information-selection processes of the pupil. Without such direction, the pupil may do more than take random samples of information from the motion picture. Each pupil may obtain a different random sample. Indeed, there is much evidence that perception often involves taking a random sample of information, and, in the 1960s considerable research was devoted to perception as a sampling process.

FILTERING AND PIGEONHOLING AS ORDERLY INFORMATION REDUCTION MECHANISMS

The most widely-held theory concerning the way in which information is reduced by the nervous system has been a theory developed by Broadbent, known as filter theory. Recently, Broadbent has added to filtering a second process which he calls pigeonholing.

The essence of filter theory is that the nervous system can be set so that only certain information will pass to the higher centers. The idea of information selection and reduction through filtering fits nicely with common experience. If one is looking for mushrooms in the woods, then any mushroom-like object will seem to catch our attention, but if we are not looking for mushrooms then one may not see any, even if they are there. Filter theory suggests that one may set the visual perceptual system to see mushrooms, or to see any other class of objects. The analogy is with a mechanical filter, but there is nothing known about the perceptual systems to suggest how a filter system might work in relation to perception.

There are some common human tasks that involve little more than filtering. Scanning the pages of a book in search of information about a specific topic, such as conditioned reflexes, involves adopting a set to see the term **conditioned reflex,** whenever the term appears. This is like setting a filter that will screen out every word except the pair of words for which one is searching. Everyone who uses books knows that kind of task can be performed with surprising efficiency. The words that one is looking for seem to jump out of the page, though occasionally one may miss a particular item. An interesting feature of this kind of task is that one can set the filter for a number of different items, all of which are searched for at the same time. The evidence indicates that one can search for ten items simultaneously with the same efficiency for each item as one can search for a single item. There is also a commercial version of this task found in the work of those who scan newspapers for newspaper-cutting agencies. Those who search the newspapers may scan for as many as 100 items at the same time. They can do this because they have worked long at the task and do not have to memorize each day a new list of 100 items. The list of searched-for items has been slowly built up during a long period of work. Filter theory accounts rather adequately for these forms of behavior, as well as for many others.

Filter theory has its critics. One criticism is that in order to see the apples on the tree, for which the filter is set, one would have to examine each leaf to determine that it is not an apple. Such a criticism is not entirely sound. There are mechanical filters that will sort out a particular class of objects without examining each and every object. A mechanical separator, at a gravel pit, sorts out pebbles of different sizes without examining each pebble to determine the class to which it belongs. The modern airport security system sorts out heavy metal objects without examining every object. The metal objects trigger an alarm, but the system ignores the other objects.

Filter theory is related to the theory of attribute analysis, in that the theory implies that the filter is set in terms of the attributes of the objects that are to pass the filter. Thus, in looking for mushrooms one is set to respond to small white objects. Smallness and whiteness are critical features which enable one to identify mushrooms. With the filter thus set, objects that do not have these critical features will be excluded. A large sheet of newspaper will not be approached. The filter also represents a coarse screening. One is not sure that all relevant objects that are spotted will be mushrooms. Those objects that pass the filter will be inspected further. When the person searching for mushrooms sees a small white object, the object will be checked for correct shape and for correct detailed appearance. The filtering out of a class of objects represents one stage in a sequence of stages used in the location and identification of the objects.

The orientation of pupils who are to see some audiovisual materials can be thought of as partially a matter of setting the filter to pass certain classes of information, but the orientation involves far more than this. Orientation also involves alerting components of the memory system to assimilate certain pieces of information in particular ways. Before showing a film on reptile life, a single sentence on the part of the teacher may set the filters of the pupils so as to result in selective attention to reptiles, but the more difficult task of the teacher is to explain to the pupils that they are to try and comprehend how the physical form of each reptile gives it a capacity to survive in its environment. In other words, the pupils must have some understanding of how they are to assimilate selected aspects of the information.

Pigeonholing is an entirely different form of information selection, which differs from filtering in important ways. An example of pigeonholing is found in looking for books that might contain information on a particular topic, but whose titles provide no direct cues as to whether the topic is covered in the book. If one is looking only for books that have titles which refer to a particular topic, as when one is looking for books on, say, masonary, one only has to set the filter to pick up the titles that contain the work. A simple setting of the filter will enable us to locate the books. However, if one were looking for information on different kinds of bricks, one probably would not get very far by examining only books with the word **brick** in the title. One might have to wade through books with many different titles to locate the information needed. One would probably look at books on masonry, but also books on ceramic materials, on clays and earths, on building materials, on the chemistry of ceramics, and on many other topics. In looking for the needed information one would have to make some judgments as to whether each book should be looked at further, or whether the title should eliminate it from further consideration. This is the process of pigeonholing. It requires thought and knowledge. It does not have the rapidity of filtering, and neither does it have the automaticity of filtering. It is a thoughtful and slow process. Pigeonholing shares with filtering the objective of reducing large amounts of information to manageable quantities.

OVERLOADING THE SYSTEM

All information systems respond in some way to overload. A telephone system, when subjected to overload, handles some calls and gives a busy signal to others. The human system has several ways of handling overload. When the human is under pressure to take in more information than the system can handle, the common response is for there to be a total breakdown in the reception and use of information. This kind of response is sometimes seen in psychological experiments. Ask a subject to learn a series of 10 nonsense syllables flashed onto a screen at the rate of 2 or 3 a second, and many adults will, after 10 trials, have learned none of the syllables. One might expect them to be able to learn at least the first or the last syllables in the series, for these can be easily read, but that is not what happens. The learners who fail to learn a single syllable are overwhelmed by the speed at which the syllables are flashed onto the screen. They make no effort to organize their behavior so as to be able to pick up a few of the syllables and to ignore the rest. Their behavior is directed towards mastering the task as a whole, and that they cannot do.

Trained individuals may take a very different approach to situations that involve information overload. A person who works in a busy office may learn to process the information only from those aspects of the job that have to be processed immediately. The worker may not at times answer the phone at his desk, even though he knows that the call is for him. He may not respond when he is called by name by another worker. Such a worker is handling the overload in much the same way as the telephone system handles overload, by making a decision as to what information is to be handled and ignoring the rest. However, the point should be noted that this strategy for handling overload requires prolonged training. It is not the typical strategy of the child, who is much more likely to respond to overload with a response of bewilderment.

Overload is observed in classrooms in which the teacher talks rapidly and expansively, and without attending to the responses of the pupils. A bewildered class results. Programmed texts control the rate at which information is provided to some degree, though much of the control remains within the decisions of the learner. One suspects that information should be processed by the learner at a rate just below that which produces overload, but that rate has to be largely a matter of the judgment of the instructor. The learner may not necessarily choose that optimum rate if left to set the pace. Some learners will even overload themselves, as when a person sets goals for reading textbook materials that are far beyond those that can actually be achieved.

Problems of overload virtually have not been studied as they should have been, and neither have there been investigations of how individuals can be trained to cope with situations involving potential overload. There is a little evidence from experimental studies showing that individuals typically fail to cope with information overload in experimental situations, but much more systematic research needs to be undertaken.

The setting of the filter is one way in which potential overload is handled. Indeed, overload is most likely to take place when there is virtually no specific filter setting.

ORGANIZATION IN MEMORY AND PERCEPTION

In previous pages some stress has been placed upon the idea that some information has to be stored in memory before meaningful perception can take place. Many lines of evidence point in that direction. The organizations of information in memory that make perception possible can be viewed in several different ways. There are obviously innate stores of information that make initial perception possible, and around which new information becomes assimilated. There are also later-developed organizations which, necessarily, have to be linked to the inside organizing elements.

Basic organizations in memory that result in the acquisition and utilization of information, in the form of some kind of action, are commonly viewed as what are called **schemata** in current literature. The term was first used in a psychological context early in the century by a neurologist, Henry Head. In recent times the term has been extensively used by Jean Piaget, also to describe organizations of behavior around which learning takes place.

Schema theory takes the position that all learning takes place in relation to schemata that grow in scope as learning develops. The theory is not particularly clear about how information is added to a schema, but the theory implies that the acquisition of information can take place only in relation to a schema. In the absence of a relevant schema, learning can not take place. This view of learning has come from traditional epistemology. John Dewey, for example, refers, in many of his works, to the "assimilation" of knowledge, implying that knowledge is built, and can be built, only in relation to existing knowledge structures. One cannot learn that for which there is no structure to which it can be assimilated. Piaget has embraced assimilation theory, and has taken the position that the growth of knowledge, through the perceptual systems, can take place only in so far as there are schemata to which the new knowledge can be assimilated. Piaget also extends that theory by introducing a second way in which knowledge is acquired, and that is through the process of accommodation. The latter involves an adaptive change in the schema itself, in contrast with assimilation, which involves only adding to the scope of the schema.

The theory is correct in asserting that the acquisition of knowledge always requires some preexisting internal structure to which it can become assimilated. Other aspects of the theory remain controversial, even among whose who embrace the theory. Piaget, for example, emphasizes the action components of schemata, and sometimes even asserts that **knowledge is action,** much as behaviorists have asserted. Other psychologists working in the field of perception find evidence that mere exposure to information may result in the information becoming structured, organized, and retained. The classic studies of Fantz showed that merely exposing an infant to simple designs resulted in the retention of some information about those designs. Eleanor Gibson describes an experiment showing how exposing adults to designs results in greater discriminability of those designs. In such experiments, the action component of the schemata involved is quite minimal. Both the infant and the adult move their eyes while scanning designs, but this is a part of the information acquisition process, rather than a response to the information acquired.

In Piaget's later writings, he makes a distinction between the earlier organizations of behavior, which he refers to as schemes, and the later, largely learned, organizations and organizers, which he refers to as schemata. These later organizations, which have inputs, outputs, and central components, he also refers to as structures. In the mature intellect, major organizing structures are related to logical thought. One can identify logical inconsistencies in what one reads or hears because the inputs will not assimilate to the logical structures that one has. When the adolescent hears the adminsitrator of an intelligence test tell him that, since those killed in railway accidents are generally in the last car of the train, and that as a safety measure the last car should always be disconnected from the train before it starts, the adolescent will recognize that the logic is faulty, because there is always a last car. The 7-year-old will see no logical inconsistency in the statement, because the child has not yet acquired the logical structure that permits the analysis of the problem.

All instructional materials are useful only in so far as there are schemes or schemata to which the content can be assimilated. There are children still in our society, who come from very impoverished homes, who have virtually never seen anybody read until they come to school. For such children books are quite meaningless objects, for they have nothing to which they can assimilate the idea of a book. Such children will face the task of learning to read with complete bewilderment, for they have not yet learned what reading is or what it can achieve. The investigations at the University of Chicago, in the early part of the century, showed clearly that the home experiences of children related to reading were crucial components of the task of learning to read. These home experiences presumably develop schemes or schema related to reading. Even though the child may not be able to read, the schemes or schema enable him to recognize the significance and the nature of the reading task. The experiences develop schema to which the tasks related to reading, provided by the school, can be assimilated. Structures that permit the interpretation of experience have to be built in an orderly way if they are to function effectively.

The discussion of schemata raises the long-discussed issue in education of the role of verbal responses versus direct-action responses in the building of knowledge. Piaget has written extensively on this issue over the years. He minimizes the effect of mere exposure to verbal information in that the development of a schema always requires the development of the ability to use inputs in a way that constructs outputs. Although some evidence has been cited that inputs alone may sometimes impress themselves on memory and become a part of permanent knowledge, learning can be enormously enriched if they are accompanied by outputs. Consider an 8-month-old infant who has been presented with a small red wooden cube. If the infant can only see the cube behind a sheet of glass, the amount of information the infant can acquire is extremely limited. If the infant is allowed to manipulate the cube, then the situation permits him to turn the cube in different directions and to begin to comprehend the 3-dimensional nature of the object. The infant can also explore the solid properties of the object and learn that a sound can be made by banging the cube on the table top, but that no sound is produced when the cube is transferred from one hand to the other. The infant will also be able to feel the edges of the cube and relate what is felt to what is seen. When the infant is allowed to handle and manipulate the cube, a wealth of information can be obtained that could not otherwise be obtained. Manipulation and action can enrich schemata in a way that passive observation cannot. In turn, knowledge becomes linked to action. Action is not only a rich source of knowledge, but it builds action-related knowledge. The traditional view of education has been that the same is not true of older children. Let us consider the case of an adolescent in a general science class.

Suppose that a general science class is discussing the way in which positive lenses form real images. The expository method of teaching would involve a description of a positive lens, and the way in which it formed an image, and perhaps a demonstration of image formation. A much greater range of information could be meaningfully explored if the student were given opportunities to experiment with image formation. They would then learn the degree to which the distance of the lens and of the screen could be varied and still produce an image that appeared to be in focus. The children could explore the effect of tilting the lens slightly and what happens when half the lens is covered, and other interesting effects. The adolescent can ask important questions about image formation and then find answers experimentally. This is good training in how one should go about exploring the world, and it is fun. Direct experimentation with lenses provides a richer source of information than can be easily provided through teacher-conducted demonstrations, and thought and action become closely linked as they must be if they are to be effective. Also, learning to ask significant questions is at least as important as finding the answers. In addition, there is some evidence that undertaking action oneself seems to impress the results on memory better than when one merely observes another asking the questions and finding the answers.

Despite all evidence to the contrary, there are those who still believe that knowledge can be efficiently poured into the student, in a manner analogous to the filling of a jar with water. One of the most expensive educational development projects of the last quarter-century involved the development of films covering every phase of elementary physics. Hundreds of films were made at a cost equivalent today of perhaps 30 million dollars. The idea behind the film was that knowledge could be poured into the student. Fortunately, the physics teachers of the country had the good sense not to use the materials, which have remained unused for more than a quarter century. One has to admit that the materials are superbly made, and beautifully staged, but they are just not designed in terms of how pupils can learn physics effectively. There is a place for the expository teaching of physics, but probably not until after the students have had some opportunity to explore phenomena for themselves.

An important developmental factor that determines whether the individual can or cannot profit from expository teaching is the extent to which activity can be internalized. The mature thinker can conduct experiments in thought. Every scientist does this, imagining what would happen if certain conditions existed. The mature thinker has great capability in manipulating internal representations of the external world, but the immature thinker often cannot. Studies of the internal representation of children in the preschool years indicates that they can represent internally that which they have seen, but cannot represent the same situation with certain features changed. Such children cannot manipulate internal representations of the world, and, hence, are very limited in what they can conceptualize. For such children, much learning has to take place through the physical manipulation of the concrete world, and it is through such manipulation that knowledge is built.

Even after some capacity to manipulate internal representations has been achieved, the ability to do this remains limited through the elementary school years, during which time the capacity to represent abstract ideas remains extremely limited.

TRANSFER ACROSS PERCEPTUAL SYSTEMS

The prevailing view, until recently, was that the infant was born with completely independent perceptual systems for acquiring information. The infant's concept of space as related to learning was believed to be completely independent of the infant's concept of space as related to vision, and the haptic system provided a further independent concept of space. The unified concept of space of the adult was believed to be acquired through learning, and slowly points of space in one of the systems came to correspond with points of space in one of the other systems. This view has, today, been largely abandoned. The prevailing view is that the infant is brought into the world with a unified concept of space.

The new view, incorporating the unified concept of space in the infant, is not really a surprising conclusion. Most higher animals are born with a completely unified concept of space. Thus the newborn calf or foal will raise itself on its legs immediately after birth and move towards its mother. In order for the calf or foal to be able to stand up, the calf must be able to coordinate space as experienced visually with space as experienced through the muscles of the legs and the haptic system. The calf also seems to be able to locate objects in space almost immediately, including the nipples through which it is fed. The human may have somewhat less capacity for comprehending space at birth, and much less capacity for demonstrating the understanding that the calf has, but the cumulative evidence indicates that the infant has far more understanding of a unified space than earlier generations gave the infant credit for having.

The implication is that the perceptual systems, at the higher levels of information processing, are unified to a high degree. What is learned auditorially about events in space is assimilated into the same representation of space as that into which visual information is incorporated. There seems to be a single, unified, internal representation of space and the spatial properties of objects. This fits well our common concept of our understanding of space. A surgeon who probes into the body through a small incision understands what the probe tells him of what is there. When the incision is enlarged he is not surprised at what he sees, for he sees just about what the probing tells him was there. What he sees is completely coordinated with what he learned through the haptic system. A person does not, of course, have an auditory system that provides very precise information about spatial properties, though there are other animals, such as the bat, that can explore space with precision through the auditory system.

A large amount of evidence has been collected to show that information learned through one of the perceptual systems become rapidly available to the other systems that can handle similar information. This has been called the sensory-integration hypothesis. There is some evidence that sensory integration improves during childhood, and also that brain-damaged children may not show the same degree of sensory integration. One important implication of the sensory-integration hypothesis is that the same information may be learned through one or another of the perceptual systems, though not all information can be learned through all systems. For example, color cannot be learned through the auditory system. At one time psychologists suggested that verbal mediators undertook the transfer of information from one perceptual modality to another, but the evidence does not support that position. A more tenable position is that the information from all perceptual modalities enters a common memory system. Others have taken the position that in normal individuals, all information tends to be translated into a visual memory system. Regardless of the mechanism, the information does become readily translated from one system to another, and there is extensive transfer across the different systems.

RECEIVING INFORMATION THROUGH MORE THAN ONE PERCEPTUAL SYSTEM

Instructional devices that provided inputs through both eye and ear began to gain a market in the late 1930s and received enormous impetus to their development during World War II, during which time they became a major means of instruction in the military. The talking motion picture, as it was then called, came to be viewed as a major educational device, and the publishers of educational materials enthusiastically became major sponsors of this new enterprise. Around the enterprise there grew up a theory of information transmission which, to some degree, justified its development.

The central postulate of the theory of audiovisual information was that more information could be acquired if information was pumped in through two perceptual systems than if the information was transmitted through only one. This aspect of the theory seemed to imply that the limitation upon the amount of information which could be assimilated resided at the sense-organ level, when the actual limitation is at higher levels of recognition and analysis. The general theory of audiovisual instruction provides an umbrella coverage of a number of different conditions, each of which should have been investigated separately. The condition that the writers of books on audiovisual materials usually had in mind was the one in which the same information was transmitted, simultaneously, through the auditory and visual systems. A simple case of this occurs when the instructor reads aloud to the pupil material that the pupil reads simultaneously to himself. A more complex case, in which there is a less-close parallel between the auditory and visual inputs, is that in which the student examines a visual display while a voice describes the display. These were the main conditions that the audiovisual theory discussed, and these involved redundant information transmitted through two different perceptual systems. More complex situations involve the transmission of non-redundant information through two perceptual systems, as when an object is shown through the visual channel, and the name of the object is given auditorially. The association is learned across the perceptual channels. An additional condition is that in which the auditory perceptual system is used to direct the activity of the visual perceptual system, as when a voice tells a viewer to look at a structure in the middle of the screen and to note certain features.

Early research undertaken both by psychologists and by educational research workers led to the conclusion that more was learned when information was presented through more than one perceptual system than when the information came in through a single system. However, the conclusion that information introduced through more than one system produced more learning, because there were two channels of entry, was a false conclusion. The apparent enhancement of learning resulting from the use of more than one perceptual system was a result of the fact that the learner could choose to learn through the channel that was the most efficient for that particular learner. Thus when all learners were learning through the most efficient channel for each, the resulting average performance was better for the group provided with both auditory and visual systems than it would be if there were no choice of systems. The individuals in the experiments almost certainly did not learn through both the auditory and the visual system at the same time, but learned through a single perceptual system chosen by them.

The situations which were explored in these early studies of multi-channel communication and learning used materials that were far different from typical educational materials. Some studies used nonsense syllables and single words. Others used prose passages, and one whole series involving the three perceptual systems of touch, hearing, and vision used patterns of left and right positions. These tasks are very different from those typically found in audiovisual instruction in which essential, non-redundant information arrives through both the visual and the auditory channel. Far more work needs to be undertaken to explore the latter condition of learning.

The research undertaken in the mid-1960s on this problem was dominated by the theory that information could be received only through a single channel at any particular moment. The term **channel** here refers to any coherent sequence of messages that have some unity to them. A perceptual system, such as the auditory system, might be bombarded by several channels of communication at one time, as when one is in a room and many people are talking at the same time, but information is derived from only one channel at any particular time. If a person is talking very slowly, or saying very little, then a listener may not have to listen all the time to that channel to keep track of what is being said. Under the latter condition the listener may appear to be attending to two channels at once, but, in fact, there is a back-and-forth switching. The single-channel hypothesis describes rather well how individuals handle information. The highest levels of information-handling seem to operate very much like a single-channel system.

The single channel hypothesis implies that nothing is to be gained by transmitting simultaneous redundant information through two perceptual systems, though the use of two systems may permit the individual to select the perceptual system that is most efficient for the purpose.

During the last 15 years there has been a considerable volume of research on bi-sensory inputs of information. Much of this research has had to do with the rate of reaction to a stimulus presented through two perceptual systems versus through one. The results have typically shown a small increase in speed of reaction when two redundant inputs are used in comparison with one. A similar kind of facilitation is found on signal-detection tasks. A faint signal, transmitted through both the eye and the ear, is more likely to be detected than is a faint signal transmitted through either sensory channel alone. Such studies do not have any great relevance to education. Of rather greater significance are studies which show that signals transmitted through one perceptual system may have arousal effects which facilitate the reception of information through another perceptual system. The latter phenomenon bears a superficial resemblance to the technique used in instructional films in which the first few seconds of the film involve the playing of loud music, which may well produce an arousal effect. The laboratory experiments are sufficiently remote from actual teaching situations that studies need to be conducted with materials similar to those used in instruction, to see whether similar results are obtained with classroom materials.

There may be other advantages to methods of instruction that use more than one perceptual system at the same time. One system may be used to set the filter on the other system, as when the viewer of a film is told verbally to look for certain features in the visual display. Furthermore, the importance of imagery in promoting verbal learning suggests that verbal learning may be promoted, in some instances, through providing simultaneous visual material. Those who have developed materials for foreign language learning have typically used visual materials to build associations between objects and names of objects. These problems have scarcely been investigated in relation to the development of instructional materials, but they need to be systematically studied. There is a sufficient body of theory available at this time to guide a quite large and orderly investigation of the use of multiple perceptual systems in instruction.

SIMULTANEOUS VS. SEQUENTIAL INFORMATION PROCESSING

The perceptual systems, by their very nature, vary in the degree to which they are structured in such a way that they can take in multiple sources of information simultaneously. The ear is so structured that it has quite a limited capacity to do this. The cochlear in the ear can register several notes at the same time, and a chord is heard from which the trained musician can abstract the component notes. Most of the information coming in through the ear appears to enter the auditory perceptual system on a sequential basis, though complex speech sounds may involve simultaneous inputs, but that does not mean that the sequentially-ordered items of information are handled sequentially at the higher levels of information processing. A sentence cannot be understood by merely registering a sequence of words and assigning a meaning to each word as it arrives, one at a time. A sentence can be understood only in so far as the words that compose the sentence are all held in a memory system long enough for the structure of the sentence as a whole to be analyzed. A sentence could not be analyzed, to the point where meaning could be abstracted, if each word were somehow analyzed as it entered the system and only as it entered the system. Word position in a sentence is an important basis for assigning meaning in the English language, and a sentence has to be held in a short-term memory in order for analysis to be performed. Thus, the auditory system involves both sequential components of information-handling and simultaneous components. The input of speech may be largely successive, but the analysis at higher levels involves the simultaneous analysis of batches of information that have entered the system sequentially.

When language is transmitted through the visual system by means of print, the initial transmission of information is not of the sequential nature that it appears to be. Experimental evidence indicates that, at each fixation, a chunk of information is typically entered, each chunk consisting of several words. However, the chunk taken in through the eye is too small a quantity for analysis to be undertaken effectively at the higher centers, so chunks have to be held in a short-term memory until a large enough quantity of information is held to permit analysis. Some kind of holding mechanism obviously has to exist, even though the capacity of the eye is large enough to permit it to take in large amounts of information simultaneously.

An interesting question is whether or not the holding mechanism discussed with reference to the ear is the same as the holding mechanism discussed with reference to the eye. The issue has long been a controversial one, and the controversy has not been settled. The problem is complicated by the fact that visually-transmitted work-sequences may be immediately translated into an auditory form, as when one speaks the words as one reads them. Some have suggested that all verbal material is coded into an auditory-verbal memory.

THE NEED FOR EXPANDING THE SCIENTIFIC BASIS OF EDUCATIONAL TECHNOLOGY

Most of the world's technologies existed, in a primitive form, long before they came to rely upon a scientific foundation. Iron has been smelted from ore for at least 2,500 years, but only in the last century did it become possible to control the smelting process with precision so that ingots that met precise specifications could be consistently produced. The quite large iron-smelting plants of the Roman era produced iron of variable quality, some of which occasionally approximated modern steel, but most of which was soft and malleable. Nevertheless, an iron smelting technology existed long before there was any scientific knowledge which could be used to guide the enterprise. The development of scientific knowledge not only permitted smelters to produce ingots to meet precise specifications, but also permitted great improvements in the properties of the metals that were produced. The primitive state of metal-smelting technology until the nineteenth century is comparable to the primitive state of educational technology today. Educational products derived from that technology are useable, but rather uncertain in just what properties they will have. A scientific knowledge of information processing and information storage seems to represent an important scientific foundation for the development of a vastly improved educational technology, though other sources of scientific knowledge will also play a role.

An odd feature of educational technology is its apparent detachment from the little scientific knowledge that is available, a detachment that perhaps reflects the limited scientific knowledge that has relevance for the field. Present policies of sponsored research place more emphasis upon conducting investigations within educational technology itself rather than in expanding scientific knowledge related to educational technology. Thus the N.I.E. is much more likely to fund research related to comparing three different forms of educational materials than research related to how knowledge is assimilated, or how it is integrated with other knowledge, or whether it makes a difference whether one perceptual system or another is used to take in the information. Even with the natural sciences, human information-processing is not a well-funded area.

Educational technology is also separated from scientific knowledge that might have relevance for its development by another significant fact. That fact is that colleges of education, which train most of those who enter the field of educational technology, do not provide any training in the behavioral sciences. Training in research for the educational technologist is largely limited to courses in statistics. There was a time, half a century ago, when at least some colleges of education recognized that training in the behavioral sciences had to be provided for those entering educational research, and there were even some colleges of education that housed the department of psychology. Today there is typically a complete separation of the behavioral sciences from whatever is taught in colleges of education. The result is a technology of education that derives nothing from a scientific foundation. Much of modern educational technology has no more scientific foundation than had the Roman metal-smelting plants. History shows clearly that a technology can slowly advance without a scientific foundation, but that its progress is extremely slow. The progress in metal production from Roman times to 1800 was minuscule, compared with progress since 1800. One can expect the same minuscule progress in educational technology, if it remains isolated from the main body of the behavioral sciences, as it is isolated today.

There are some signs that the isolation of educational technology is coming to an end. For example, there is at least one distinguished college of education that is developing a curriculum in neurophysiology, for those in education who wish to explore the implications of this important body of knowledge. A few isolated colleges and schools of education provide modern courses in perception and learning, sometimes even working with the department of psychology. Sociologists are now showing a return to their interest in education which they manifested earlier in the century. The interest in educational problems shown by some scientists in related behavioral sciences is not enough to produce a scientifically-based educational technology. The educational technologist must become thoroughly familiar with knowledge in related scientific areas, just as the metallurgist has to have a thorough grounding in chemistry and physics if s/he is to have success in improving the technology of metal production.

SOURCES AND REFERENCES

The purpose of this section is to indicate the sources from which the chapter was derived and also to provide a list of materials that a reader might turn to for the purpose of expanding her or his knowledge of the field. Fortunately, eminent scientists have devoted time to the development of a literature on the subject within the scope of the general reader. Such works represent stepping stones to the more technical literature in the field.

Current literature on perception, as well as the present preceding chapter, find their roots in J.J. Gibson's The Senses Considered as Perceptual Systems (Boston: Houghton Mifflin, 1966). The Gibson book was the first to view perception as involving information-gathering systems. The material on perceptual learning and the organizing functions of perception are based, to a considerable extent, upon E.J. Gibson's work, Principles of Perceptual Learning and Development (New York: Appleton-Century-Crofts, 1969). Several well-written books, by eminent scientists, on the psychology of vision have appeared in recent years, and the books provide greatly expanded versions of the material covered in this chapter. One of the first of these outstanding books on visual information processing is that by R.L. Gregory, The Intelligent Eye (London, England: Weidenfeld and Nicholson), and another, more recent one is J.P. Frisby's Seeing (Oxford, England: Oxford University Press, 1980). Much of what is known concerning the way in which the brain processes information, and particularly visual information, has been summarized by the eminent physiologist, Cain Blakemore, in the thoroughly readable book Mechanics of the Mind (Cambridge, England: Cambridge University Press, 1977). The latter book is based upon a series of lectures given over the B.B.C. The September 1979 issue of the Scientific American is entitled The Brain, and provides a valuable review of much that is known about neurophysiology and the analysis of sensory information. Information analysis in the nervous system is discussed at a more technical level in a volume edited by R.F. Schmidt entitled Sensory Physiology (New York: Sprinter-Verlag, 1978). Since much of the work of the neurological analysis of visual information has been undertaken on the cat, the matter of the comparability of the cat's visual system and the human's is important. This is fully discussed in an article by R. Blake, "The Visual System of the Cat," (Perception and Psychophysics, 1979, 26, 423-448). Blake's article also reviews the evidence concerning the nature of the lazy-eye phenomenon and the establishment of the fact that the phenomenon is due to a failure of development within the central nervous system.

Attribute analysis is extensively explored in the 10-volume series, edited by E.C. Carterette and M.P. Friedman, collectively entitled Handbook of Perception (New York: Academic Press, 1973-1978). In this series, information analysis in each perceptual system is considered separately in volumes assigned to each.

Issues related to multimodal perception, that is to say, perception through more than one perceptual system, have been discussed in a very scattered literature. One aspect of this area is discussed by L.W. Marks in a chapter entitled "Multimodal Perception" in Volume 8 of the Handbook of Perception. This latter article largely ignores the kinds of problems in which the designers of audiovisual materials have been mainly interested in the past, namely, the transmission of redundant information through two perceptual systems. One source of information related to this problem is found in Travers' report entitled Research and Theory Related to Audiovisual Information Transmission (U.S. Department of Health Education and Welfare Contract No. 3-20-003, 1967).

The single-channel concept of human information reception was first developed by D.E. Broadbent, and is described in his book Perception and Communication (New York: Pergamon Press, 1958). A later version of filter theory is found in his article "The Hidden Preattentive Process" (American Psychologist, 1977, 32, 109-118)).

The concept of a schema has been extensively used in psychological literature throughout the present century, particularly by those psychologists who have broken away from an associationistic representation of knowledge. Piaget used the concept in his writings for over 50 years, but the concept is used by such moderns as U. Neisser (see his book Cognition and Reality (San Francisco: Freeman, 1976)).

The control of behavior by vision, apparent through the study of blind infants, is brought out in the work of Selma Fraiberg in her book Insights from the Blind: Comparative Studies of Blind and Sighted Infants (New York: Basic Books, 1977).

J.M. Kennedy's book A Psychology of Picture Perception (San Francisco: Jossey Bass, 1974), remains a valuable source of information on picture perception for those designing educational materials.

Chapter 11

Knowledge and Its Acquisition: An Introduction and Overview

Buford E. Wilson

How is knowledge defined? How is it acquired? What must instructional developers know about these topics if they are to be competent designers of instruction? Do the answers lie in experimental psychology? behavioral psychology? cognitive psychology? How greatly do individuals differ in their abilities and approaches to the acquisition of knowledge? This chapter analyzes these questions and provides some guidelines for IDers which should aid them in the design of instruction.

KNOWING

Over the past fifteen years literature in the psychology of learning has shown a renewed interest in mental processes. Concerns with mental representations of external events and the cognitive processing of information are now central issues in the study of human learning (e.g., Neisser, 1967; Bower, 1975).

A new and exciting conception of human learning is emerging from this resurgence of interest in cognitive psychology. This new characterization is founded in experimental psychology, but has its historical and theoretical roots in Gestalt psychology and in the psychology of humans, which existed in Europe early in this century (Bartlett, 1932; Humphrey, 1963). It is, consequently, a radical departure from the conceptions of learning derived from behavioral psychology. In this chapter I will attempt to give the reader an overview of this new conception and discuss some of its basic implications for the design of instruction and instructional material.

As a way of beginning to think about your knowledge of the world, think of your house or apartment. Close your eyes and imagine yourself in your living room. How many windows are in that room? Now, move on the kitchen. How many windows are there? Proceed through the rest of the house counting windows. How many windows are there in total? If you have lived in your present home for any time at all, the task of counting the imaginary windows is not difficult. This simple mental task illustrates the power and usefulness of our knowledge of the world. Most people have not counted windows in their homes. It is not a fact that has been memorized, but our ability to recreate and manipulate mentally parts of our world allows us to solve this problem easily.

Our knowledge allows us to represent to ourselves things and events which are not present. It allows us to manipulate these objects and events mentally in order to solve problems, or to imagine possible problems. For example, what problems might you encounter if you decided to move a piano into your home? What changes or special arrangements would be necessary before such a

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move was possible? Depending upon your home and your imaginary piano, you might have problems related to narrow stairways, small doors, or high balconies. The point is, that your knowledge of the world allows you to represent to yourself parts of the world which are not present. Additionally, it allows you to manipulate and change these representations in order to anticipate and solve problems. You can imagine solutions such as moving walls or taking out windows and decide if they are practical solutions, or actions which would cause more trouble than they are worth. This chapter will provide a general characterization of knowledge and the process of knowledge acquisition.

Many of our everyday assumptions about knowledge are incorrect. One such assumption is that our knowledge of the world is based upon copies or replicas of our experiences. It seems natural and correct to assume that we know what it was that we did yesterday because we somehow made copies of what we experienced. Sometimes we can't remember all of what happened. This forgetting, it is assumed, occurs because our copies of our experiences have become weak, distorted, faded, or mixed with other copies and therefore have become hard to recover. This set of assumptions about the nature of knowledge and its acquisition has a long history in philosophy (Ackerman, 1965) and psychology (Boring, 1950). In fact, it is an important theoretical underpinning of the behavioristic psychology which dominated American psychology for 50 years.

As we shall see, however, our knowledge of the world is not based upon faded or distorted copies of reality, and we do not acquire knowledge by making and storing copies of what we experience. Consider once again your knowledge of your home. As the counting-windows task demonstrated, you do have a great deal of useful knowledge about your home. This knowledge, however, is not like a copy or replica of things in the world. It is much more like a general outline or schematic representation. Most people can easily draw a rough outline of their home, including placement of furniture, windows, stairways, etc. This ability depends upon knowledge of their home and of the objects in it. While our knowledge allows us to generally characterize our world, it rarely contains the detail or specificity contained in a copy or photograph. Details of color, size, shape, or orientation frequently are not included in our knowledge of very familiar things. This would not be so if our knowledge was based upon mental copies of our experiences.

Consider the couch in your living room, presumedly an object with which you are familiar. What is its color and shape? If it has a pattern or design, try to draw this pattern. If not, try to draw its shape exactly. How do the cushions and arms articulate with the back of the couch? When you try to reproduce details of the objects and events in your world, you find that the task is difficult even for familiar objects.

What object could be more familiar to modern man than the telephone? Most of us use the telephone daily. Children play with toy telephones. Yet upon close examination, our knowledge of the telephone is not as detailed as we would expect. Which letters are on the telephone dial? Which letters are not? Which letters are by the numeral 1? Most people don't know which letters of the alphabet are not on the dial, and most people do not know which letters are by which numerals. In fact, the letters Q and Z are not on the telephone dial. Further, the numerals one and zero do not have letters accompanying them. Clearly, we do not have the detailed knowledge that would be expected if we were able to copy and store our experiences of the telephone. We do, however, have a great deal of useful knowledge about the telephone. We know the general shapes it can take. We know which way the dial turns, where to speak and where to listen. In short, we have the knowledge necessary to operate the telephone. It is important to see that while your knowledge is not a copy of reality or of your experiences it is a useful and coherent representation of those parts of the world with which you interact. You are able to move successfully from place to place, find solutions to problems which arise, and predict and understand many objects and events with which you interact.

Psychologists have documented in many different situations our ability to gain useful knowledge from our experiences even though we are unable to recount or recreate those experiences exactly. It is useful to examine some of these situations in order to begin to understand the nature of the knowledge we gain from our experiences.

In psycholinguistic studies, researchers have found that subjects frequently acquire a correct representation of the meaning of sentences, but do not acquire knowledge about the exact form of the sentence. For example, they may fail to remember if a sentence was presented in the active or passive voice even though they can remember the information presented in the sentence (Mehler, 1963; Slobin, 1968). The physical difference between "John hit the ball," and "The ball was hit by John" is considerable, but the information conveyed is indeed similar. The subjects seemed to acquire a correct abstract or general representation of the meaning of such sentences without acquiring a copy of what was actually experienced. A similar result was reported by Sachs, (1967) who found that subjects readily detected changes in sentences they had previously read if the changes altered the meaning of the sentences. However, subjects had great difficulty detecting changes in the sentences which left the meaning unaltered.

This ability to acquire abstract representations from our experiences is not limited to language phenomena. Jenkins, Wald, and Pittenger (1978) reported a similar finding when subjects were shown photographs of a woman making tea. In this study, 24 photographs were taken depicting the various steps involved in the preparation of tea. Sixteen of these 24 pictures were shown in the acquisition phase of the experiment. Later, these 16 pictures, plus the remaining 8 from the original set, were shown to subjects, who were asked to indicate whether each picture was new or was one which had occurred during acquisition. Subjects were unable to distinguish the new but appropriate pictures of the event from the pictures which they had actually experienced during acquisition. The subjects had acquired an abstract representation of the event but not copies of pictures actually experienced.

Posner and Keele (1968) found that when given experience with classes of patterns, subjects acquired abstract representations which allowed them to correctly classify novel instances of those classes. Figure 11-1a shows the prototype (original) and 5 other instances of the class triangle. Figure 11-1b shows the prototype of the other classes.
After experience with the distortions from these categories, subjects were able to recognize new distortions and the prototype patterns even though these instances had not been seen before. Later, Posner and Keele (1970) concluded that while the conceptual system which allowed subjects to correctly classify novel instances of the classes of patterns was gained from experience with the class of patterns, this conceptual system was not derived from stored copies of those patterns. This conclusion was based upon the fact that one week after the original experience with patterns the subjects' ability to classify the patterns originally seen had decreased, while their ability to classify the new prototypic patterns had not. These results demonstrate that the subjects were in fact acquiring knowledge which allowed them to classify correctly novel instances of patterns, but that this knowledge was not based upon stored copies of the original patterns. If the ability to classify new patterns was based upon stored copies of the original patterns, the ability to classify the new patterns would decrease as the knowledge of the original patterns decreased. In fact, decreases in ability to identify the patterns seen during acquisition did not cause decreases in subjects' ability to recognize the new patterns. This demonstrates that the ability to classify novel patterns was not based upon stored copies of the original patterns.

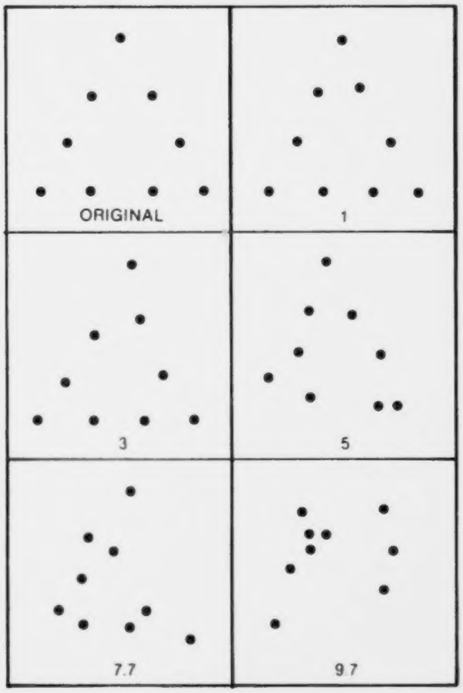

Figure 11-1a. The prototype and five levels of distortions for the set of triangles.

Franks and Bransford (1971) demonstrated that while subjects could acquire a rule system concerning relations between geometric forms, they were poor at distinguishing instances actually seen during learning from instances which fit the rule system but had not been seen before. That is, the knowledge acquired was knowledge of a system, not copies of specific cases. Reed (1972) found similar results with subjects learning to categorize simple drawings of faces.

These studies show that across a wide variety of situations what is learned is an abstract representation of the objects and events that we experience. They also show that these abstract representations are not based upon our ability to store copies of our experiences. Our knowledge is an abstract or general representation of our world, and not a copy of the world or of our experience of it.

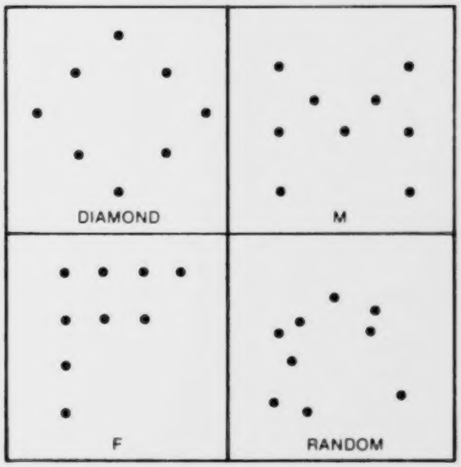

Figure 11-1b. Prototypic patterns of other sets: diamond, M, F, and random.

These abstract representations are not a result of copies of our experiences which have become faded or distorted. Faded or distorted copies of our experiences would not reliably provide us with accurate characterizations of objects and events. A Polaroid picture which has not finished developing is like a faded copy. The underdeveloped print does not reliably capture the objects and relationships in the picture. Facial features, parts of peoples' bodies, and even whole objects may not appear until the picture is fully developed. The faded copy does not contain the information necessary for a general representation of the objects and events in the picture. Similarly, distorted or damaged copies may not contain the information necessary for such a representation. Consider a schema of the floor plan of a house. If ink is spilled upon the floor plan a complete room could be covered, or a fireplace or a window completely hidden. The distorted copy would therefore no longer be an accurate characterization of the floor plan.

As we saw earlier, subjects in psycholinguistic studies frequently recall the meaning of sentences but are unable to remember if the sentence was originally experienced in the active or passive voice. We want to make two important points about these findings. First, faded or distorted copies of the sentence, "The ball was hit by John." would result in the loss of some of the words or letters in the sentence. Such a loss of items would often change or distort the meaning. For example, if "by" was lost we might, at the time of recall, mistakenly substitute "to" in its place, producing "The ball was hit to John." If the "b" in "ball" was faded or distorted or partially faded or distorted we might mistakenly remember "The wall was hit by John." Many errors could occur which would change or destroy part of the meaning of the sentence. These types of errors did not occur in the studies we reported. In fact, subjects retained the meaning of the sentences when the form in which the sentence occurred was lost. It seems implausible that the subjects' memory for the meaning of the sentences was based upon faded or distorted copies of the sentences.

The second point is that if the subjects' knowledge of the sentences was in the form of copies of the sentences, considerable fading or distorting would have to occur to cause

"The ball was hit by John,"
and
"John hit the ball,"

to be confused with each other. Physically, the sentences are quite dissimilar. The order and position of the words is different in each case and the passive voice contains two more words than the active voice. If enough distortion or fading occurred to make the copies of the above two sentences indistinguishable the copies would no longer convey the meaning of the sentences.

Both of these points demonstrate that the subjects' knowledge of the sentences cannot be derived from faded or distorted copies of the sentences actually experienced. These two points can also be applied to the studies we discussed above. That is, it can be shown that the subjects' knowledge of sentences (Sachs, 1967), random dot patterns (Posner and Keele, 1970), rule systems (Franks and Bransford, 1971), drawings of faces (Reed, 1972), and a tea-making event (Jenkins and Wald, 1979) cannot be explained on the basis of faded or distorted copies of items experienced during learning.

An attempt has been made to show that our knowledge of the world takes the form of abstract or general representations of the objects and events we experience. An argument has been presented that on the one hand our knowledge does not have the detail or exactness found in copies and on the other that faded or distorted copies cannot provide an adequate basis for the knowledge we have about our world.

If we do not copy our experiences and use these copies as the basis of our knowledge, how do we gain knowledge about the world? Clearly, experience with the objects and events in our world is important and we do gain information from these experiences. What, then, is the relation between our experiences and our knowledge of the world?

Before the advent of behaviorism, the problem of the relation of experience and knowledge was seen as important by psychologists studying learning. The rebirth of interest in cognitive psychology has brought with it a renewed interest in the relation of experience and knowledge. A basic insight shared by those interested in this problem is, that new learning presupposes some knowledge-structure to which the new information can be connected or related. If we are not able to copy our experiences we must have some way to relate our experiences to existing knowledge. Norman (1969) states, "for something to be learned or remembered it must be integrated within the existing organization of knowledge." Bower (1975) states "In characterizing learning, one is interested in...how that information comes to be represented and related to other things as it is stored in long-term memory" and "the learning of a new fact or concept is solely a matter of recording its representation, which is in terms of a specified configuration of relations among already-known concepts." These authors are acknowledging the fact that we can only understand something in terms of what we already know.

Piaget (1954) has brilliantly described how children conceptualize the world differently than do adults and how this knowledge leads them to interpret or understand their experiences differently than adults do. Infants will, when first given a rattle, put it in their mouth. They only gradually learn to shake the rattle to make a noise. At first, they understand or know the rattle in terms of its feel and shape as determined by their mouth and tongue. The acts of sucking, tasting, and feeling objects with their mouth are an important part of the infant's knowledge of the world. Consequently, they will gain knowledge about a rattle that most adults would not. The infant will probably learn about tastes of plastic or glue from their experiences and they will feel indentations or scratches that we might not notice. They are understanding the rattle in terms of what they already know. They are not copying their experiences, they are interpreting them in terms of the knowledge they already have. They do not have adult knowledge which would allow them to say, "it is a pink and blue hollow sphere with little bits of rock inside." Notice, however, that they are acquiring knowledge about the rattle, knowledge which is useful to them. They use this knowledge to create or build general representations of the objects and events in their world. Their knowledge of the world is very different from ours, and therefore the knowledge they gain about the rattle will in turn be different. The meaning they create will be different from the meaning we would create.

The act of interpreting what we are experiencing in terms of what we already know is the basic process of knowledge acquisition, i.e., learning. This use of existing knowledge to make sense of current experiences can take many forms ranging from simple recognition or verification of something already known to the actual creation of new knowledge. Consider the following three examples as points along this continuum. Often we assimilate current experiences into our existing knowledge. This is a chair. This is a blackboard. This is the number 3. In these cases the experience is related to existing knowledge with little readjustment or use of the existing knowledge. At other times we make sense of our current experiences by using or readjusting our knowledge. For example, researchers frequently ask subjects to discover patterns or regularities. Katona (1940) asked subjects to discover the principle which related the numbers in Figure 11-2. Solving this problem involves the use of existing knowledge, e.g., knowledge of numbers, puzzles, and possible relationships, to look for regularities and test possible solutions. We will discuss Katonas' problem and its solution again later in this chapter. Whitman and Garner (1962) presented subjects with lists of geometric forms which were related by rules. For example, the four binary attributes, one or two, large or small, red or blue, and circles or squares, can be used to generate 16 possible geometric forms. Subjects were given 8 of these 16 forms as an acquisition set, i.e., memory set. Discovering the rules distinguishing forms in the memory set from forms not in this set would enhance the subjects' ability to recall the geometric forms. That is, they could use the rules to generate the possible forms in the memory set. Remembering the rules would be easier than remembering all of the instances. Whitman and Garner found that subjects were able to discover the rules relating the forms in the memory set. The difficulty of recall in their experiments depended directly upon the complexity of the rule relating the forms in the memory set.

Figure 11-2. Array of digits used by Katona, 1940. See text for explanation.

2 9 3 3 3 6 4 0 4 3 4 7

5 8 1 2 1 5 1 9 2 2 2 6

In the studies by Katona (1940) and Whitman and Garner (1962) the subjects used their existing knowledge to discover a rule or regularity existing in their experiences. Finally, consider an instance in which we use our existing knowledge to make sense of current experiences by actually creating new knowledge. Suppose that we already know how to compute the area of a rectangle. It follows that half of this area would be the area of half of the rectangle. Now suppose that you were drawing right triangles and notice that they were always one-half of a potential rectangle. Suddenly, it occurs to you that you can compute the area of the right triangle by computing the area of its potential rectangle and dividing by 2. You have used your existing knowledge to create new knowledge. You have created new knowledge to make sense of your current experiences. This is not an unusual use of your knowledge. Imagining the difficulties of moving a piano in your home also involved the creation of new knowledge, i.e., knowledge of difficulties or solutions you had not considered before. This ability to generate novel thoughts and actions is a basic attribute of human knowledge. What we know and remember are the products of these mental activities, by which we make sense of our current experiences. The child who believes that the moon is following him, or that the number of items in a row can be changed by simply stretching out the row (Piaget, 1954) is learning something quite different from what we might learn from the same experiences.

Similarly, the knowledge gained at a ballet or basketball game by a serious fan and by a novice will be strikingly different. These two types of observers have different knowledge about the events they are watching, and consequently the meanings of the events will be vastly different. That is, the experiences will be related and integrated into different knowledge structures. The novice will have little knowledge of the strategies or patterns of movement involved. He probably will not see or remember subtle interactions which have a tremendous importance to the experienced observer. The knowledge that we bring to a set of experiences will have a tremendous effect upon what we learn from those experiences.

Degroot (1965) and Chase and Simon (1973) report that, as you might expect, master chess players are much better at remembering sequences of moves and positions of pieces in chess games than are novice players. This makes sense because master chess players are able to integrate individual moves into their knowledge of strategies and counter-strategies. Chess masters frequently are able to recall large sequences of moves correctly. If, however, the masters are requested to try to remember random (meaningless) changes in the position of the chess pieces they are not superior to the inexperienced player. The chess master who cannot relate the position of the pieces to his knowledge of strategies and plans is in the same position as the novice who has very little knowledge of strategies or plans. In both cases understanding and remembering the moves involved in a game is dependent upon being able to make sense of the current experiences in terms of existing knowledge. The novice is unable to remember long sequences of mores because he does not have much knowledge which enables him to see or understand these sequences as coherent, meaningful patterns. The master is in the same position as the novice when the moves are random, i.e., he cannot relate the individual moves to his knowledge of strategies and counter-strategies. What is learned is the product of the mental activity of relating and interpreting current experiences in terms of existing knowledge. When the master is unable to relate experiences of the changes in positions of the chess pieces to existing knowledge, this great wealth of knowledge is of little use.

We have described knowledge acquisition as the process of interpreting current experiences in terms of existing knowledge. Now we will turn to a consideration of two implications of our characterization of knowledge acquisition. The first implication is that existing knowledge is a strong determiner of what is learned from current experiences. The second is that current experiences can be related to existing knowledge in many ways, thereby producing different types of knowledge. Consider the first implication. A non-English speaking listener does not have the knowledge necessary to allow him to understand this sentence. He would be unable to use his existing knowledge to make sense of his experience of the sentence. Depending upon his existing knowledge s/he may or may not know that marks on the paper are some form of communication. It is even possible that s/he could have knowledge which allowed her/him to understand that the words are English words but still not know what the words mean. These examples make the simple point that understanding and learning are strongly determined by what you already know.

Consider the list of words in Figure 11-3. This list is made up of words from four categories: spectator sports, occupations, fuels, and geological formations. Each of the categories contains five words, making a total list of twenty items. With the knowledge that you will be asked to remember this list, read it through one time slowly and out loud at the rate of about one word every 5 seconds.

Figure 11-3. Categorized word list and a typical recall protocol for that list.

WORD LIST	RECALL PROTOCOL
football	golf
mountain	football
oil	hockey
doctor	carpenter
gas	lawyer
baseball	doctor
teacher	valley
valley	cave
kerosene	mountain
dentist	wood
river	oil
wood	gas
basketball	kerosene
lake	river
nurse	
hockey	
butane	
carpenter	
cave	
golf	

Now close the book and write down as many of the words as you can remember. Write them down in the order that they come to mind. Allow yourself two or three minutes to recall as many of the words as you can.

When you examine what you were able to remember, two things are immediately apparent. You can remember a large number of the words in the list, and your recall is organized in terms of the categories in the list. Figure 11-3 contains a typical recall protocol.

Consider first the amount of recall. With a little practice with such lists most people are able to remember 15 or more of the words. This is an unusually large amount, but it is typical of the recall of word lists made up of familiar categories. Psychologists have shown that lists made from familiar categories are remembered much better than comparable lists of unrealted words (Bower, 1970). Your existing knowledge of the categories, occupations, etc., allows you to form the words in each category into a mental group. This grouping of the words in terms of your existing knowledge makes it easier to recall the items on the list. You are able to form four mental groups for recall instead of trying to recall twenty separate items. If you didn't have prior knowledge of a particular category, this advantage would be lost for that category. If you had no knowledge of any of the categories, then your recall would not be aided at all by the categorized list and would be no better than the recall of twenty unrelated words.

Next, consider the order in which the words were recalled (See Figure 11-3 for a typical recall protocol). The words tend to be recalled in groups of items from the same category even though words from the same category did not occur together in the actual list. Compare the order in which the words were presented and the order in which they were recalled. The subjects' knowledge of the words they experienced is organized in terms of their existing knowledge.

In fact, most peope have almost no knowledge of the order in which the words actually occurred. What word occurred before doctor? What word followed lawyer? These are hard questions, but "what are some other occupations?" is not difficult to answer. Suppose we were given the task of memorizing a long list of names. The fact that this list was made up of dancers and of baseball players from the 19th century would be of little help to most of us. That is, these categories probably would not affect the amount or the organization of what we learned. However, to students of dance and baseball this structure in the list could be extremely helpful. As the work on categorized word lists has shown, existing knowledge can determine both the amount and organization of what is learned from current experiences.

Earlier, we used DeGroot's (1965) and Chase and Simons' (1973) studies of chess masters to illustrate that gaining knowledge entailed making sense of current experiences in terms of existing knowledge. A comparison of the master and novice also demonstrates the role of existing knowledge in determining what can be acquired with current experiences. The existing knowledge of the chess masters enables them to make sense of long series of moves in terms of strategies and counter-strategies. The novice who does not possess this extensive knowledge is unable to relate the sequence of moves to existing knowledge. The novice is left with the unmanageable task of remembering the individual moves as many unrelated instances.

As an example of the second implication, consider the English word "now." We can relate the physical event of the word to our knowledge in many different ways and produce different types of knowledge. We can consider it as a sound and notice that people with different accents pronounce it differently. We can consider it as a physical object and learn that it is longer or shorter than our first name. We can consider it as an answer to the question, "When do we eat?" or a command, "Not later, now!" It is possible to create a seemingly endless number of ways of relating this event to our existing knowledge, e.g., it is made up only of letters from the last half of the alphabet. We can go on and on finding new ways to relate or interpret the event "now" in terms of our existing knowledge. These different mental activities frequently produce different knowledges. We might pay attention to someone's accent and miss part of what they say, or notice the shape of letters during handwriting analysis and not the known words or word meanings of the materials we are analyzing.

In 1932 Edward Thorndike reported a series of experiments investigating the relation of external and mental events. Specifically, he wanted to know the effects of repetition upon the nature of mental representations. In a typical study his subjects were given the following instructions: "I shall read you a long list of pairs or words and numbers like 'bread 29,' 'wall 16,' 'Texas 78.' You will listen as I read them. Pay about as much attention as you would in an average class. Be sure that you hear each pair as I read it." Notice that the instructions lead you to build mental events made up of pairs. That is, you relate 'bread' and '29' in your mind. Similarly, you are asked to relate 'wall' and '16.' You are requested, however, to relate '29' and 'wall.' If these pairs always occur together in the order 'bread 29,' 'wall 16,' '29 and wall' occur together as often as 'bread' and '29,' or 'wall' and '16.'

Thorndike wanted to know what effect the repetition of '29' and 'wall,' one after the other, would have upon mental constructions. Would the repetition of the items cause them to be related in the subjects' knowledge of the lists? Thorndike found that in cases like this, even though the items occurred together 24 times during the experiment, subjects still had no knowledge of the relationship. The average percentage of correct responses for these items was 1/2 of one percent! In contrast, subjects were able to correctly respond to the intended pairings 38 percent of the time. Even when repeated 24 times, the pairing of '29' and 'wall' did not automatically become part of the subjects' knowledge. Even with many repetitions, the mental events did not become replicas of the external events. Once again, the mental activity of the learners (the formation of pairs) was more important to learning than the structure of external events. In the same work, Thorndike reports the results of a similar study conducted by another psychologist, Van Der Veldt, in which nonsense syllables were paired with hand movements. The correct ordering of the pairs was not learned after 2,490 trials. The manner in which we interact with the events and objects in our world is indeed a strong determiner of what we gain from these experiences. And the structure of the external events is not necessarily a good predictor of the structure of these mental constructions.

In the Thorndike experiments on belongingness, some relationships were not learned by any of the subjects even though the relationships were repeated many times. Now we wil turn to a situation in which everyone learns the items perfectly after very little practice. In Plans and the Structure of Behavior, Miller, Galanter, and Pribram discuss the following technique for remembering ten items and their order of occurrence.

> One evening we were entertaining a visiting colleague, a social psychologist of broad interests, and our discussion turned to Plans. "But exactly what is a Plan?" he asked. "How can you say that MEMORIZING depends upon Plans?
>
> "We'll show you" we replied. "Here is a Plan that you can use for memorizing. Remember first that:
>
> one is a bun,
> two is a shoe,
> three is a tree,
> four is a door,
> five is a hive,
> six are sticks,
> seven is heaven,
> eight is a gate,
> nine is a line,
> ten is a hen."
>
> "You know even though it is only ten-thirty here, my watch says one-thirty. I'm really tired, and I'm sure I'll ruin your experiment."
>
> "Don't worry, we have no real stake in it." We tightened our grip on his lapel. "Just relax and remember the rhyme. Now you have part of the Plan. The second part works like this: When we tell you a word, you must form a ludicrous or bizarre association with the first word in your list, and so on with the ten words we recite to you."
>
> "Really, you know, it'll never work. I'm awfully tired," he replied.
>
> "Have no fear," we answered, "just remember the rhyme and then form the association. Here are the words:
>
> 1. ashtray
> 2. firewood
> 3. picture
> 4. cigarette
> 5. table
> 6. matchbook
> 7. glass
> 8. lamp
> 9. shoe
> 10. phonograph."
>
> The words were read one at a time and after reading the word we waited until he announced that he had the association. It took five seconds, on the average, to form the connection. After the seventh word he said that he was sure the first six were already forgotten. But we persevered.
>
> After one trial through the list, we waited a minute or two so that he could collect himself and ask any questions that came to mind. Then we said, "What is number eight?"
>
> He stared blankly, and then a smile crossed his face; "I'll be damned," he said. "It's 'lamp'."
>
> "And what number is 'cigarette'?"
>
> He laughed outright now, and then gave the correct answer. "And there is no strain," he said, "absolutely no sweat."

In this technique for remembering, the learner builds a mental construction containing the to-be-remembered word and a word that rhymes with the to-be-remembered word's position in the list. This technique provides a way of interacting with the to-be-remembered word which guarantees that a mental construction appropriate to the memory task is built; that is, a mental event which contains the information that you will need later, i.e., the word and its position. The rhyming word relates the mental image to the learners' existing knowledge of the numbers 1 through 10. When the image containing the word and the rhyme is built, memory for the word and its position in the list is virtually assured.

These two learning situations, i.e., pairing words with numbers, and learning using a mnemonic technique, taken in conjunction, demonstrate the importance of the mental activity of the learner. It is the nature of the mental activity of the learner that determines what is learned. The external structure may or may not be reflected in the products of these mental activities.

In summary, human knowledge has been characterized as an abstract representation of the objects and events we experience. Knowledge acquisition was described as the act of interpreting current experiences in terms of existing knowledge. Finally, knowledge was described as the products resulting from the mental activities involved in relating current experiences to our existing knowledge. Let us now turn to a consideration of implications of this point of view for the design of instruction and of instructional materials.

APPLICATIONS TO INSTRUCTION

When we move about in the world, meeting people, doing our jobs, going here, going there, we are constantly acquiring knowledge. Most things we do give us new information: her name is Linda; to get there you turn right on Crawford; it rained yesterday; the Bears beat the Rams. We gain knowledge from almost all of our experiences. A basic concern for those of us interested in instruction and in instructional materials is exactly how we gain this knowledge. That is, what conditions are required in order for learning to occur? Some experiences seem almost automatically to lead to learning, while at other times something can be repeated over and over and still leave us unaffected or confused. Simply having an experience is no guarantee at all of learning.

When learners have appropriate existing knowledge and the current experiences are easily related to this knowledge, learning can be quick and effortless. Indeed, many of these experiences we do not consider as learning. We don't consider it learning to have noticed that an attractive person walked into the room, or to hear that our favorite team miraculously won another close one. These are, however, facts which are being acquired, things we are learning from interacting with our surroundings. When we read a novel, watch a movie, or have an intimate conversation with a friend, we are acquiring immense amounts of information. Yet, this learning usually seems effortless and occurs without conscious intent on our part to remember what we are experiencing.

In this section, we will consider how better to arrange instructional situations so that learning is a natural product of experience and not a forced or artificial task. As we saw in the first section of this paper, knowledge acquisition is not a process of producing copies or replicas of our experiences. Rather, learning was shown to be a process of interpreting current experiences in terms of our existing knowledge.

The relationship between the material to be learned and the existing knowledge of the learner is crucial in the design of instruction and of instructional materials. Acordingly, the first implication for instruction is that the instructional situation must be designed so that the learner is able to make sense of the instructional materials in terms of their existing knowledge.

This is not to say that humans are unable to learn things by rote, i.e., build mental copies, or that learning things by rote is never useful. It is to say, however, that learning by rote is not the natural or usual way we acquire knowledge about our world. Further, the knowledge we gain from rote learning is not the natural or usual type of knowledge we acquire.

If we reach back into our childhood, most of us have access to a poem, a speech or a document which we were forced to learn by rote. For example, most people can complete the phrase, "Four score and seven years ago..." Most of us memorized parts of the Gettysburg Address, but in doing so we learned little about the relevance or meaning of that speech. We can say parts of it upon request, but years may pass without the speech being brought to mind. It sits in our minds year after year having little meaning for us and offering no help in understanding our thoughts or experiences. It does not draw our attention to similarities between the issues and events of our times and the issues and events of the time for Mr. Lincoln. It does not cause us to notice similarities between the feelings and conflicts which we feel and the feelings and conflicts which Mr. Lincoln might have felt. And it is not a source for the understanding of books or movies about the Civil War. In fact, for most of us, the speech does not come to mind at all unless we are properly cued, as, for instance, by the line, "Four score and seven years..."

We are in a situation similar to that of the second graders who can say, "two plus two equals four", but who do not know how many oranges there are if they have two and a friend has two. They can correctly recite "two plus two equals four" when appropriately cued, but they do not understand how this recitation relates to objects and events in their world.

When we learned to recite the Gettysburg Address we did not make sense of it in terms of our existing knowledge. That is , we did not relate the contents of the speech to our knowledge of history, the United States, decision making, etc. As this example shows, meaningful and useful learning does not occur automatically with the building of mental copies. Instructional strategies and materials must lead the learner to understand (figure out) how the learning materials are relevant to the objects and events of their world.

How, then, should we proceed to arrange instructional activities and materials so that the learner is lead to use his existing knowledge to build mental representations which are more useful to him than would be mental copies?

Two basic conditions must be met before the learners will be able to accomplish this task. The first condition is that the learners must have background knowledge which will allow them to make sense of current experiences. For example, multiplication is a prerequisite for long division. You simply cannot understand long division until you are able to multiply. Similarly, without knowledge of phonetics, it makes little sense to identify "now" as a nasalized stop and diphthong vowel.

The second condition is that learners be directed toward mental activities which entail making sense of learning materials in terms of existing knowledge. William James (James, 1899) tells the story of visiting a friend's classroom and asking the children the following question. "If you dig a hole deeper and deeper into the earth, would it get hotter or colder as you went deeper?" The children did not know the answer to James' question. The instructor, hearing the interchange, said, "Oh, they know. Class, the center of the earth is in a state of..." and the class responded, "igneous fusion." Children in the second or third grade do have the background knowledge necessary to understand that the earth is spherical in shape with molten rock in the middle of the sphere. And consequently, they could deduce that it would get warmer as your approached the center. The children have the prerequisite knowledge required by our first condition, but they were not led to use this knowledge to make sense of their instructional experiences, i.e., our second condition.

Similarly, most seventh-grade students have the background knowledge necessary to make some sense of the Gettysburg Address. The problem is to get them to use this existing knowledge to build the relevant constructions. Suppose we wanted students to learn that the Civil War was fought to preserve the basic values upon which our country was founded. Understanding such a statement involves (1) having knowledge of the basic values referred to, and (2) knowing that these values and our country itself might not exist in their present form if the Union had lost the Civil War.

One strategy for helping learners to use their existing knowledge to make sense of the above statements is to (1) design instructional situations which allow learners to see how values upon which our country was founded affect them personally, and (2) show how the outcome of the Civil War could have affected their lives. We might first design learning experiences which would help learners understand the effect of our country's basic values upon their everyday lives. Such experiences could be organized around issues such as: "How might your life be different if certain human rights were taken away?" And "what effect would the reintroduction of slavery have upon your life?" Many types of learning activities such as role playing, skits, discussions, and readings about the Civil War and about civil rights could be designed which would require the learners to use their existing knowledge to understand how their lives are affected by these values. Once the learners understood the personal relevance of these values, this knowledge would provide the background necessary to understand how their lives might be different if the Civil War had not occurred. Now a statement such as "the war was fought to preserve the values upon which our country was founded" can have personal meaning to the learners. They have used their existing knowledge to create that meaning.

This task of making the historical events personally relevant is only one of many methods of engaging the learner in the mental activities necessary to create the desired new knowledge. There are an infinite number of ways in which we can encourage learners to engage in these sorts of mental activities. The basic requirement is simply that the situation be arranged so that the learners are able to use their existing knowledge to make sense of their instructional experiences. If the current experiences do not easily relate to relevant aspects of their existing knowledge, learners have little choice but to learn the material by rote.

Frequently, instructional tasks and materials actually interfere with the mental activities necessary for learning. The learner is often lead away from these mental activities and directed to the task of making a mental copy. Ironically, the more difficult the material is to memorize, the more the learner will be led away from the mental activities which would allow her/him to understand it. That is, as more time and effort are spent on the task of memorization, less is left for the task of understanding. Often, this means that the learner is deprived of her/his tools for learning when s/he most needs them. Consider once again the array in Figure 11-2. Katona (1940) asked two groups of subjects to examine this array of 24 numbers. One group was given three minutes to memorize the array by repeating groups of three numbers over and over. The second group was given three minutes to discover some pattern or structure in the array. The structure upon which the array is based can be described as follows. Beginning at the lower left corner, add 3 to 5 to produce 8, and four to 8 to produce 12, and three to 12 to produce 15. This adding of 3 and 4 in alternation is the pattern of regularity which underlies the array. Katona found that most adults would discover this structure within the 3 minutes allowed. Subjects asked to memorize the array by rote also were able to successfully accomplish their task within three minutes. After a three-week delay, Katona asked both groups to reproduce the array. None of the subjects asked to memorize the array were able to correctly reproduce it. On the other hand, 23% of the subjects asked to discover the structure in the array were able to reproduce it correctly.

Discovering the structure (meaning) of the array helped the subjects reproduce it later, even though they had not been instructed to remember the array. The memory group was not provided a means for relating the numbers to their existing knowledge. They did not make sense of the array in terms of their existing knowledge, they simply made a mental copy of the numbers in the array. Discovering the alternating addition of 3 and 4 is important. This pattern or regularity relates the numbers in the array to each other. The array is no longer a meaningless list of 24 single numbers or 8 triplets. When the principle is known, the numbers become meaningful components of a logical system of relationships. The numbers 1 and 2 in the bottom row now form the number "twelve" which fits between 8 and 15. The array now makes sense as a unit or whole, that is, as a system of relationships. This system of relationships relates readily to the learners' existing knowledge, i.e., the alternating addition of 3 and 4. The array or the experience of the array has been made meaningful in terms of the learners' existing knowledge. Instructing the memory group to repeat the numbers in groups of threes prevented these subjects from relating the array to their existing knowledge, i.e., from making sense of the array in terms of what they already know.

To this point we have considered a basic implication for instruction derived from our characterization of human learning. We have also discussed two conditions which are prerequisites to the accomplishment of this task. Finally, we will discuss a new goal of instruction derived from our characterization of learning.

This goal is the integration of the learning materials into the existing knowledge-structure of the learner. By this, we mean that learners interpret the learning material in terms of what they already know, thereby producing new knowledge which relates or has relevance to their existing knowledge. Rote memorization does produce new knowledge. But, as we have seen, this new knowledge may not be related to existing knowledge in a useful way. Often this knowledge exists as isolated bits of information which seem unrelated to other things we know and to most of our own experiences.

A child who is lead to figure out that air takes up space by blowing up balloons and bicycle tires or by submerging upside-down drinking glasses into water will have a more useful type of knowledge than will a child who has memorized a definition of matter and a list of instances of the concept.

The new information the learners acquire will be related to their existing knowledge of air, balloons, the action of blowing or pumping, tires, water, and glasses. This is just the beginning of a long list of relationships which are being acquired from the learners' activities.

It is more likely that this new knowledge will be useful to the learners in other situations involving balloons, tires, and things being submerged in water. This is true because of the relationships which were developed during the learning activities.

Repetition and drill, therefore, must do more than build replicas of the learning material. Practice and repetition must also be designed to help the learners to usefully integrate the new information into their existing knowledge. When the learners are able to make sense of the learning materials in terms of what they already know, this process of integration is off to a good start.

CONCLUSION

Learning does not have to involve relating new content to previously-learned content and/or to previously integrated experience. However, meaningful learning does necessarily involve such a process.

This insight into the nature of meaningful learning has several implications for the design of materials and for the development of instruction.

In order to facilitate the integration of the new content into the already-existing cognitive structure, the designer or developer must know what the existing cognitive structures of the target population are like.

Further, the assumption is unwarrented that the target students will all have the same cognitive structure, or that the "average" cognitive structure will be adequately representative of each individual within the target group. Individual differences in past experience and in the conceptual field this experience has been imbedded within, must be taken into account just as surely as must differences in intelligence or in cognitive style.

The new content can almost always be related to the existing structure, but in order to do this, the level of abstraction might have to be modified. Also, intervening material might have to be introduced as a sort of bridge in order to link existing structure to the new content. Examples of such links are advance organizers, field trips, laboratory experiments, films, and value-clarification sessions.

Not only must new content be relatable to existing cognitive structure, but this linking must be done in such a way that the connections are obvious to the student.

Therefore, special efforts should be taken to point out the relationships involved, using either examples, visual or textual cues, or direct statements of the relationships.

Since meaningful knowledge is actively related to, and ot passively absorbed into, the existing structure, the process of learning is an activity. It is not necessarily a physical activity; one can learn meaningfully from lectures as well as, or sometimes better than, from laboratories or field trips. But it is necessarily a mental activity, and so involves the use of cognitive strategies. Such strategies are individually devised by the student, with a great deal of diversity existing among students. The process by which the new content is integrated into existing cognitive structure, therefore, is an individual matter. Teaching should facilitate this process, should even direct it in a general sense, but should never dictate it.

Three methods are currently available, or becoming available, for facilitating the integrating process. First, new content can be presented through modes which are compatible with strategies which students already use (ATI and cognitive style technologies). Second, content can be presented in units which can be selected and ordered independently, and these selection and ordering operations can be left up to student (learner control). Third, students lacking appropriate strategies (or possessing inappropriate ones) can be taught new strategies (learning-to-learn procedures and student-development technologies).

In any case, material should be designed in such a way that new content can be seen as meaningful in terms of already-existing knowledge. This indicates that the language, whether it be written or spoken language or visual language, body language or mathematical language, should be presented in a vocabulary and grammatical structure, and with a degree of redundancy, which is appropriate to the existing cognitive structure. Words known to convey one meaning to the students for example, should not be used to transmit another meaning without the use of a cue-structure to alert the students to the new meaning.

Most important, with respect to language, is that students do not integrate content meaningfully by reproducing in their cognitive structures an exact copy of the mediating material in which the content was embedded when they encountered it. They instead abstract the meaningful content and restructure or reconstruct it in an easily-retrievable form so as to store it compatibly with existing meaning within the cognitive structure.

Therefore recall in the form of memorized lines, memorized formulas, page numbers or the names of authors (a favorite device for qualifying exams) should not be expected to result from meaningful learning, and should not be used as a measure of such learning. Further, the pressure of directions to learn such material can be expected to call forth a different set of cognitive strategies from the student which will not only result in non-meaningful learning of these materials, but will also prevent their being learned meaningfully, at least at that time.

Three principles should always be remembered when designing instruction: (1) New content can be meaningfully learned only when the student can relate this content to already-existing cognitive structure in a meaningful way. (2) The understanding of content is an activity of a constructionistic nature which is carried on by the student using cognitive strategies. (3) Students vary greatly in terms of the cognitive structures they possess and the cognitive strategies they exercise.

From these three principles it follows that teaching and instructional design are processes which facilitate the integration of new content into existing cognitive structure; they must begin by ascertaining the existing structures and strategies and they must proceed by embedding new content within material which is compatible with these beginnings.

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Chapter 12

Split-Brain Theory and Recent Results in Brain Research: Implications for the Design of Instruction

James D. Hand

The primary instrument used by instructional developers in creating, evaluating and modifying learner behavior through learning, changing attitudes and providing experiences is not the computer brain, as some books would lead one to believe, but the human brain. If we are to properly program an environment to interact with a brain so as to achieve our objectives, we must understand the workings of the brain. The following chapter summarizes recent thought and research on this topic, and draws implications for I.D.

INTRODUCTION

Much has been written of late on how the brain functions while taking in information, during storage processes, and during retrieval. Research has lead to new conceptualizations of brain functions and a great many new facts have come to light. Enough is now known about the brain to begin synthesizing the research results and applying them to the design of instruction. It is still too early to make hard and fast judgments, because applied research regarding brain function, learning and memory in the classroom is just beginning in this country. The **implications** of the results of basic research studies seem clear enough and, at the very least, point the way toward the types of educational research needed in order to confirm the educational importance of these works.

This paper attempts to answer two questions:

1. What do we know about how the brain functions during learning?
2. What do brain-function data suggest regarding the design of instruction?

The extent to which each of these can be answered is, of course, limited by the amount, types, and quality of research currently being reported.

INFORMATION INTAKE

Learning may be divided into general steps: intake of information, short-term memory storage (STS), and long-term memory storage (LTS). The intake of information is a complicated process. We are bombarded with stimuli from all of our senses during our waking hours, yet we attend to only a very few. This is accomplished by innate masking-mechanisms which are employed to suppress inputs from less-important stimuli while the brain focusses its concentration upon the more important inputs. The brain rapidly selects those cues which are important and allows them to enter the short-term memory store. It takes just 100 msec. (one-tenth of a second) to process pictorial information (Franken and Rowland, 1979). Kimura (1973) found that a 200 msec. sound duration involving a vowel and a consonant was all that was needed for processing speech into the left brain. Hyden (1977) reports that the retention of written words, singly or in common phrases, requires approximately 250 msec. (one-fourth of a second). While none of these studies were conducted as substained learning/studying sessions, they indicate a **potential** for listening rates of up to 300 words per minute (consistent with findings in instructional media research) and reading rates ranging from 240 wpm (for those who read by the line). This, too, is consistent with findings from research on reading. The amazing part of information-intake is the phenomenal possibility that the brain may be able to comprehend pictures at the rate of 600 per minute, based upon the capability of processing one picture each 100 msec. This rate is, of course, affected by the content and pattern complexity of the picture in question.

Information which is allowed into the brain by activated neurons is immediately channeled to several portions of the brain. Each of these is a storage site for certain types of information. If the receiving person decides to attend to the stimulus, the process of short-term memory storage will begin.

The implication which may be drawn from research on the brain's information-intake abilities is that, when concentrating, a person can bring in far more information than is normally presented during a lecture or during an hour of reading. This will be discussed further under "Long-Term Storage and Retrieval."

SHORT-TERM STORAGE

Recent research indicates that when a person is paying attention to a particular set of stimuli, electrical wave-patterns can be determined over several centers of the brain (Pribram, 1979). Proteins present in membranes of nerve cells, synapses and glia apparently enable the activation of vast numbers of neurons simultaneously. These proteins may provide the mechanism for the transformation of shifting electrical fields into molecular and cellular effects (Hyden, 1977). In short, proteins are present and active when input is made, and they then change as both short-term and long-term memory are established.

The short-lived reversible nerve protein changes and long-lasting remaining cell-protein changes are biochemically correlated. Within minutes after the brain's decision to attend to a stimulus, the hippocampus generates a short-lasting protein which will exist for about 24 hours. The same type of brain-cell protein production follows in the brain cortical areas after a certain delay. During learning, at least two other protein fractions are synthesized in the synaptic membranes. This guarantees that long-lasting nerve-cell changes will be made, helping establish a long-term memory.

When learning starts there is an increased systhesis of messenger RNA in nerve cells which induces the production of certain proteins and molecular patterns. Calcium helps translate electrical field charges into short-term molecular charges in brain-cell membranes. In short, the role of proteins and calcium are critical to learning. This confirms the research by Krech (1967), who found that proper nutrition six months prior to birth through six months after, concentrating on proteins and calcium, has marked effects upon brain weight, density and levels of synaptic chemicals in rats. From Hyden's research (1977) it is apparent that these same factors impact upon development of the human brain.

> "The working hypothesis is that the protein differentiation, caused by experience and learning, will secure the concomittant activation of all the neurons which have undergone a similar differentiation and on the same stimulus. It does not matter in what part of the brain the neurons are located. ...at learning neurons become highly active. The learning mechanism of the brain in the first hand is **active** not **reactive** like a reflex in a conditioned system (Hyden, 1977)."

The activation of neurons and the resultant protein changes which occur as short-term memory is formed also pave the way for more-permanent protein synthesis, which lays down the long-term memory store.

Researchers in the realms of biochemistry, electrophysiology and other neurosciences have gone beyond asking how memory is established to investigating where certain types of memories are stored. This led to studies of the lateralization of brain functions, commonly known as "split-brain" research.

LATERALIZED OR "SPLIT-BRAIN" FINDINGS

For centuries man has entertained the idea that one's logical self was somehow separate and distinct from one's emotional self. When scientists exhausted the possibilities of finding emotional centers in the heart and liver they turned, fortunately, to the brain. Broca and Wernicke were among the first to identify speech-areas of the brain, through dissection of deceased aphasics. Over the next hundred years scientists attempted to map areas of the brain which house and control various human capabilities. Lateralization of brain functions, the study of such maps, became a valid field of study.

Kimura (1973) revealed in a popularized article that auditory, visual, and manual tasks involving theoretical symbols (words and numbers) are handled **predominantly** by the left hemisphere of the brain, while qualitative symbols (spatial, nonverbal, and sensory) are processed **predominantly** by the right hemisphere. It must be emphasized at this point that Kimura's research and all others found by this author indicate that **both** hemispheres share in each type of mental activity. While one hemisphere may contribute more than the other to certain tasks, the hemispheres do not function as entirely separate structures, except in surgically-severed brains and in certain experimental settings. In other words, it is inappropriate to state that the processing of oral language is entirely the domain of the left hemisphere, or that processing of pictorial information is entirely the domain of the right hemisphere. As an example, Kimura (1973) showed a test-ratio of hemispheric dominance for processing spoken words at 1.88:1 in favor of the left hemisphere. This indicates that approximately two-thirds of the auditory word-processing involved in that particular test occurred in the left hemisphere. The ratio of stereoscopic depth perception as tested by Kimura (a "right brain function" in common parlance) was 1.28:1 in favor of the right hemisphere. In both of these cases, and all others reported by Kimura, right and left hemispheres shared the functions, albeit unequally. Therefore, while each hemisphere specializes in controlling and storing different types of information, each relies upon the other to some extent for a complete view of the world. In those with normal, healthy brains the corpus callosum and the anterior commissure connect the opposite cortical lobes and their corresponding regions of the two hemispheres. These connecting pieces ensure the sharing of functions as discussed above.

Specialization is a fairly well-established scientific concept. Certain inputs are better processed by one hemisphere than by the other. Additionally, certain **outputs** are controlled predominantly by one side. Which side, and the **degree** of control, are partly functions of age, sex, handedness, and cultural upbringing (Debes, 1977; Gazzaniga and LeDoux, 1978; Geffen, 1976; Geschwind, 1979; Krashen 1973; McGlone, 1978; Webster, 1977). In general, for persons in Western Culture, each hemisphere has predominant specialization for the following (Eccles, 1977):

Left Hemisphere	Right Hemisphere
verbal inputs	nonverbal inputs
linguistic outputs	musical processing
ideation (abstractions)	pictorial and pattern sense
conceptual similarities	visual similarities
analysis over time	synthesis over time
analysis of detail	holistic images
numerics, quantities, arithmetic	intonations, verbal emphasis
logic, sequence information	location in time and space
controls right side of body	controls left side of body
geometric configurations	intuition, attitudes

This holds true for 95% of the tested adult right-handed males from Western cultures. But what of the exceptions, which are considerable? Looking only at the laterality of speech processing we find the following:

- Adult females of Western Cultures show relatively more symmetry between the hemispheres for both verbal and performance (nonverbal) tasks (McGlone, 1978);
- Left-handed adult males and females with a family history of left handedness, tested in the United States, show that for 65% of them the right hemisphere is the primary verbal site (less so for the females, as indicated above) (Kocel, 1977);
- Children who are prepubescent show no statistically significant differences between the lateralization of male and female brains (McGlone, 1978);
- Right-ear advantage for spoken words (which are directed to the left hemisphere) for right-handed subjects reaches statistically significant proportions at age 4 (Geffen, 1976), or perhaps age 9 or 12-14 years as indicated by other researchers. In other words there is a time prior to puberty during which both hemispheres process spoken language, as evidenced by children who maintain normal reading, listening, speech, and writing abilities after left-hemispheric brain damage (Gazzaniga and LeDoux, 1978);
- Adults brought up in the Japanese culture who have learned both Kanji and Katakana as native languages show strong speech and writing skills in both hemispheres. Kanji is ideographic/pictorial, with characters simultaneously representing both a sound and a meaning. This language is represented bilaterally using both portions of Wernicke's area across the corpus callosum. Katakana is syllabic and structured much as English. Left-hemispheric damage destroys the person's ability to perform in Katakana, yet damage to **either** hemisphere still leaves the person able to communicate in Kanji. Japanese raised in Western cultures do not show these traits, indicating that the difference is cultural rather than genetic (Geshwind, 1972; Debes, 1977).

Despite the exceptions listed above, yet accounting for them also, some tentative suggestions can be advanced for the design of instruction. We have yet to discuss long-term memory research. At that time we will cover research concerning coding and retrieval strategies. For now, the discussion will be limited to initial inputs for short-term storage.

Audio. Auditory stimuli not related to words and numbers is best processed and primarily stored by the right hemisphere, entering through the LEFT EAR. Reproductions of the human voice speaking words and numbers are best processed and primarily stored in the left hemisphere from the RIGHT EAR. Remember, however, that voice intonation, inflection, and other non-verbal aspects of speech are right-hemisphere predominant. WHAT you say goes to the left hemisphere; HOW you say it goes to the right.

Lozanov (1978) reports that if the learner is in a relaxed alpha-wave state, both hemispheres work in unison to process speech. When in an alert, active, beta-wave state, the brain processes and stores verbal input predominantly in the left hemisphere.

Visual: Words and Numbers. The eye is neurologically wired to send impulses to both hemispheres. The left half of the visual field is sent to the right brain; the right half of the visual field goes to the left hemisphere. (See Figure 12-1.) When reading, the eye scans across the line from left to right (in our culture), picking up words and phrases in the right half of the visual field and sending them to the more theoretically-oriented left hemisphere. Because the eye scans verbal and numeric text, there is little advantage in attempting special placement of these stimuli in a display, **unless** there is pictorial information also being presented. In this case, the placement of the pictorial stimuli takes precendent, as described below.

Visual Pictorial. When pictorial and verbal/numeric stimuli are to be presented simultaneously, the picture should be placed in the left visual field. An excellent example of such a placement can be seen in the German language text **Deutsch 2000** by Max Hueber Verlag, printed in Germany. On the left portion of each page of a story are a series of drawings. At the right of each drawing are two or three sentences in German. The situation discussed in those sentences is graphically portrayed in the accompanying picture. While the learner's eye is scanning the lines of text, the left visual field of the eye is feeding pictorial information to the right hemisphere of the brain. The vocabulary is learned within the context of those graphics.

For purely pictorial representations, one can expect information presented to the right of the visual fixation point to be sent to the left brain. Cognitive recall, as verbalized by the learner, should be strongest for the 5° arc surrounding the

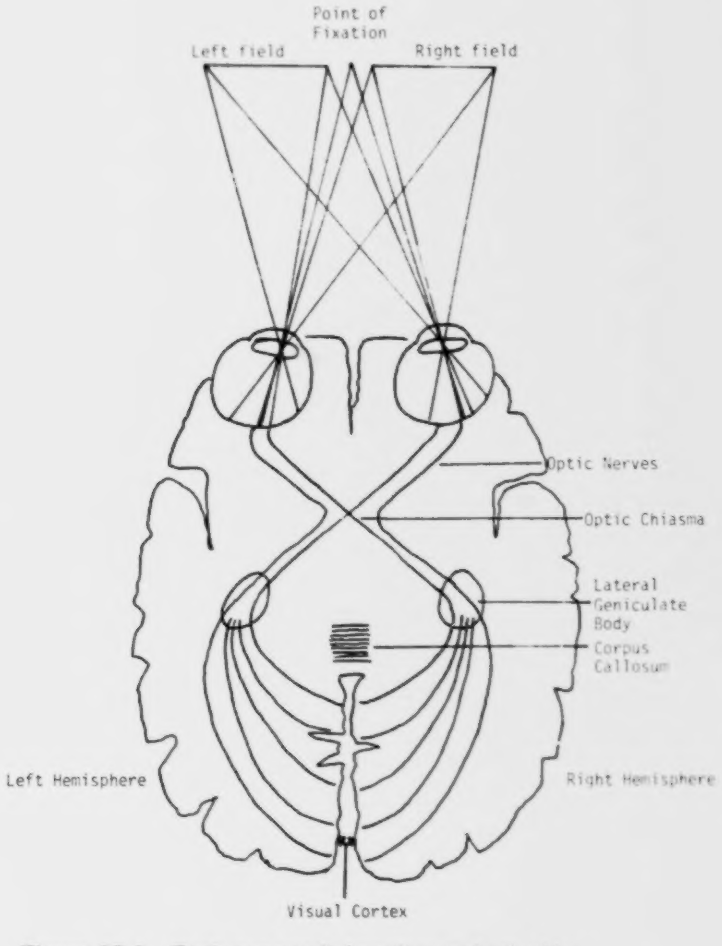

Figure 12-1. Each eye sends impulses to both sides of the brain. The left half of the visual field is sent to the right brain; the right half of the visual field goes to the left brain.

fixation point and for items immediately to the right of that. However, this author could find no studies of this phenomena in the literature to either confirm or deny this projection. Similarly, information located immediately to the left of the focal point should assist the right hemisphere in developing a feeling or attitude towards the content of the picture. Cognitive domain at the focal point and immediately to its right; affective domain at the focal point and immediately to its left. Once again, this is an hypothesis based upon anatomical research rather than upon educational research.

Tactile. The sensory cortex of each hemisphere interprets tactile data exclusively from the opposite side of the body. The motor cortex controls the motions of this same opposite side. For most learners this means that the hand and foot opposite the language-dominant side of the brain is somewhat better at carrying out actions which can be verbalized. When a language-dominant left brain says "We're going to need the socket wrench to pull that spark plug," the changes are very great that the mechanic's right hand will reach out and use that instrument. (The incidence of truly ambidextrous persons is very small, and that is perhaps the reason that there is very little evidence as to whether such persons have bilateral speech capacity.) If the same right-handed mechanic needed to gather tactile information about how smoothly the engine was running, the left hand (tied to the right brain) would be a somewhat better source.

THE PITFALL OF SHORT-TERM MEMORY

Short-term memory storage is also known as the "working memory." When a person actively thinks about and contemplates what is happening or draws information from the long-term memory so as to recall what has happened, the short-term memory is being employed. Unless what is in the working memory is committed to long-term storage, it will quickly be lost. Therein lies the pitfalls of masking, capacity, duration, item and order information loss, and recency (O'Keefe, 1978).

Masking occurs when items being processed are similar in some respect. If the items are to be remembered separately and distinctly, the differences between them must be stressed so that the brain can store them in separate categories or subcategories.

The capacity of the short-term memory is severely limited compared with that of the long-term memory. Aside from the role in short-term retention and specialized functions for language comprehension and generation, short-term memory maintains items "in a state of accessibility until they can be encoded into a contextual long-term memory system" (O'Keefe, 1978). Here, duration and recency enter into the equation. Through active rehearsal, recent inputs, including strong order identification, can be accessed by testing memory locations for recently-employed representations. Those used most recently will have lower synpatic thresholds, making it easier for the learner to recall the information. In the vernacular of students, this entire process is known as "cramming" for a test.

The pitfall for learners and teachers is that the student can juggle enough information in the short-term memory to pass most weekly or biweekly tests **without committing the information to long-term memory.** This indictment of short-term, noncomprehensive, factual recall tests is only half of the bad news. O'Keefe (1978) cites two studies which strongly suggest that verbal information in the short-term memory is stored in a "discrete neural area (the posterior parietal region), and not as a part of any causal short-term memory to long-term memory chain" (O'Keefe, 1978). If the learner is only memorizing words for temporary use, the chances of long-term retention are apparently minuscule.

Overcoming the pitfalls occasioned by the utilization of short-term retention for passing tests may be accomplished through several instructional strategies, such as:

. Rewarding the learner for correct use of the information in solving problems, as in simulations, essay responses, term papers, or even well-constructed multiple-choice questions for which the student must make several decisions prior to reaching a conclusion;
. The "discovery method," in which the learner must analyze and synthesize information in order to discover an underlying principle;
. Inductive-deductive switching, in which the instructor uses one of these methods for presenting information and then directs the learner to situations, problems, or test items which ask the student to use the other thought process.

Other methods, such as "overlearning," will be discussed under "long-term memory storage," which follows.

LONG-TERM MEMORY STORAGE

Information entered in long-term storage (LTS) is multiply encoded i.e., specific aspects of an experience are stored in multiple locations in the brain because the experiences themselves have multiple aspects (Gazzaniga and LeDoux, 1978). Much of the brain has been mapped in terms of the function and type of information stored in given sites. Thus, through electroencephalography using scalp electrodes and other noninvasive techniques, the researchers can determine some of the cortical areas active during an instructional event. This, in turn, reveals something about the sensory inputs being processed. Similarly, the researchers can map the active areas of the brain during recall and compare these areas to those active during information gathering. Thus far, Pribram (1979) and others point out, there is a very high degree of correlation between the areas active during both intake and recall, both in terms of latency (delay of activity) and amplitude (voltage of the encephalogram).

During learning for LTS, many millions of neurons from different brain centers apparently are activated. Each activation seems at first to be localized within its own center, but soon spreads by association mechanisms to other parts of the brain. The paths along which these activations occur eventually lead to the entorhinal and related areas in the cortex and pass on to the hippocampus. The hippocampus does not seem to store new information; instead, its cellular mechanisms--electrical and molecular--are activated. The induction of biochemical activity, inducing protein differentiation of nerve cell membranes and synapses, spreads to different areas of the cortex via subcortical connections. The biochemical definition of **learning,** then, is protein differentiation of brain cells governed by the genetic mechanism (Hyden, 1977).

It is supposed that the same stimuli which induced protein differentiation in brain cells during learning can activate all brain cells, wherever they are located, during retrieval, provided only that they share the same pattern of protein differentiation. All similarly differentiated cells have the same qualitative and quantitative values in the space/time coordinates of contextual memory. The sum of these differentiated activations in the brain is considered to be the contextual memory.

Types of LTS Memory. Many neurobiologists, as cited by O'Keefe (1978), now believe that there are two basic LTS systems: the **taxon system** and the **locale system.** The workings of the latter are as described above. The mechanisms of the taxon system are not as well defined. The taxon LTS is not contextual, is not time-referenced, and is rote in nature. If the spelling of the word R-E-T-R-I-E-V-A-L is difficult for you, your taxon system may be at fault because the "E" after "I" rule should be employed. If you memorized the names of the Presidents in serial order, with no real concept of the time at which each served, the taxon system LTS would be the one employed. Unless this information were somehow stored **contextually** within the locale system, you would find it difficult to use the list of Presidents for any type of problem solution. This would also be the reason why health science students (medicine, nursing, dentistry, and pharmacy, for example) who memorize drug names, indications and contra-indications for use, and potential side effects by using the taxon LTS, have difficulty in solving case-problem test items for which the locale system's LTS must be used.

More explicitly, the locale system includes time/space coordinates for fixing events in spatial and temporal relationships. There have been times in nearly everyone's lives when they have met a person for the second time, yet failed to remember that person's name: an embarrassing failure of the taxon system. Yet, after some thought, you are able to construct the situation in which you first met the person - who else was present, what the surroundings were like, what activities you engaged in. This context, fixed in time and place, has been preserved in the locale system LTS.

In summary, the features of these two LTS systems are as follows:

Taxon System

- categorization by features similarity.
- abstraction of prototypes which incorporate critical attributes of the category members (models).
- absence of spatio-temporal context coding.
- consequent absence of order, time and place information.
- substantial decay over time.

Locale System

- preservation of spatio-temporal context.
- single-occurrence storage
- minimal interference between different representations of the same item.
- multiple channels of access for retrieval of any, or all, of the relationships embodied in the memory.
- relatively permanent (O'Keefe, 1978).

Memories which rely primarily upon one communication mode will be nearly context-free, which means that they will be stored in the taxon system and are subject to decay unless used often. The neuronal threshold can be kept low through repetition and practice of those items in taxon LTS.

Memories which are encoded from multiple stimuli form a context which is apparently stored in the locale LTS. These memories are, according to Pribram (1979), holographic in nature and can be retrieved by stimulating brain cells by simulating some of the circumstances under which the memory was formed.

IMPLICATIONS FOR DESIGNERS OF INSTRUCTION

(1) If what is to be learned is rote, verbatim, categorical or rule-oriented, the taxon system LTS should be emphasized.

An example of this would be the first step in teaching the concept "mammal" by defining the critical attributes: warm blooded, female gives live birth, female suckles its young. If this set of abstractions is practiced until everyone in the class can recite the definition verbatim the taxon LTS has been encoded for "mammal." **Overlearning** enhances recall from the taxon system through lowering the neuronal threshold.

(2) If that which is to be learned must be applied to new and different situations, the locale (contextual) LTS should be emphasized.

The former example was predominantly

verbal and without context. If we now wish the learner to apply the definition of mammal by selecting examples and non-examples of mammalia from a list of animal names or pictures, then a context must be taught so that the memory of "mammal" is established in the locale system. Herein lies another strong implication. Clarity of a memory is enhanced by increasing the number of neurons and brain centers activated when memory is recalled from LTS to short-term storage. The number of neurons and centers activated during recall is limited to the number used to attend to and store the information in the first place. Maximizing the number of neurons and centers can be accomplished by simulating the context within which the memory was initially formed.

(3) Being careful to not detract from the clarity of the message, use as many types of sensory and theoretical inputs as possible in establishing the learning context.

(4) When the information or process being learned has direct applicability to some future learning or use situation (such as a job task) the **learning should take place within a context as similar as possible to the context within which it will be used in order** to enhance recall.

(5) Design tests so as to measure the information stored in the same LTS system your teaching was designed to store it in.

It is unreasonable to assume that instruction designed to reach and be stored in the taxon system will automatically be posited in the locale system as well, and vice versa.

(6) When teaching for storage in the locale memory, stress visual representations.

Haber (1970) and Franken and Rowland (1979) have found that the picture memory of humans is remarkably efficient. There is tremendously large storage capacity for pictorial representations and, therefore, for visual **contexts** with which to associate other items for recall. While most picture memory loses detail, the meaning or sense of the representation is retained, with enough of the pattern to reconstruct most of the main elements portrayed in the original picture.

(7) At the conclusion of the learning session, have the learners relax for a few moments while they rehearse what they have just seen or heard.

Memory practice and verbal associations between what was said and what was seen increased subjects' ability to recall and uncover previously-unremembered details in Haber's study (1970). The 'old saw' that a student should take a break and do something entirely different at the end of a study session was discovered to be a detriment to learning.

(8) Combine as much as possible into a single impression.

If a series of items or steps must be mastered, it is best to teach them as discrete elements **at first.** Once they are mastered, the student will be able to recall them more easily as a **set.** In teaching someone to drive an automobile or perform cardiopulmonary resuscitation, there are literally hundreds of separate steps to master. In the end these steps should be logically grouped into sets such as "starting the car," "parallel parking," or "external cardiac massage." This becomes one form of mnemonic, an interactive mnemonic (Higbee, 1979).

(9) The more vivid and active the impression of what is being learned, the stronger the memory trace.

Imagine for a moment the level of neuronal excitement in a child's brain when a teacher says, "Now listen, class, because this **will** be on the test Tuesday. George Washington was born on February 11, 1732. His birthday changed to February 22nd in 1750 with the advent of the Gregorian calendar." Now imagine a creative teacher who role-plays Washington, or asks a parent to do that; or shows a movie in which Washington and Franklin sit at a table and attempt to calculate what their "new" birthdays will become under the Gregorian calendar. The context of seeing two men in eighteenth-century dress in a home of that era, by candlelight or oil lamp light, speaking Early American English, would obviously produce a more vivid and active impression than just the teacher's voice doling out pearls of wisdom.

Lozanov (1978) and Higbee (1979) indicate that it apparently matters whether this vivid, active imagery is developed externally or internally. Those who have a high ability for mental imagery finds self-generated mediators more effective, while those with low ability (such as the very young and mental retardates) find images more effective when supplied by others.

(10) Practice is essential, but it has to be the right kind.

Practice to enhance taxon memory should be rote: short, simple, and ordered in logical sequence. Practice to enhance locale memory should incorporate several types of symbols, verbalizations, and sensory channels.

(11) Recall is more difficult (limited) than is recognition.

Recall calls upon the verbal system as well as upon the nonverbal. The verbal system can only report that which is stored there. Therefore,

(12) Recitation or writing the information from one's own thoughts will enhance verbal recall.

The verbal portion of the brain has limited capacity, so only the most important, verbally-practiced information is stored.

In a recognition task, nonverbal centers have an opportunity to express themselves by pointing to or selecting from a series of objects. With this response available for tasks such as multiple-choice and matching test items, all information that the multiple nonverbal systems have stored can be reported, making the student seem more resourceful than he would if a recall question is asked.

(13) Ask the learner to verbalize during perceptual experiences.

When information of a perceptual nature, regardless of the input modality, is encoded while the information is being simultaneously verbalized, the internal language system is active, and the information is encoded verbally as well as nonverbally, and a bond forms which allows the language system some access to memories laid down by the nonverbal systems.

THE TRIUNE BRAIN

Recent work by MacLean (1973; Holden, 1979) at the National Institute for Mental Health's Laboratory of Brain Evolution and Behavior has led to the development of a brain-structure model termed the "triune brain." "Triune" refers to three separate and distinct functional entities composing the brain: the reptilian complex (R-complex), the limbic system, and the relatively massive neocortex. These three portions hold quite different mentalities, according to MacLean, each with its own special abilities, its own view of the world, its own sense of time and space, its own memories, and its own motor and other functions (Sagan, 1977). These three portions act as interconnected biological computers developed sequentially **in utero.**

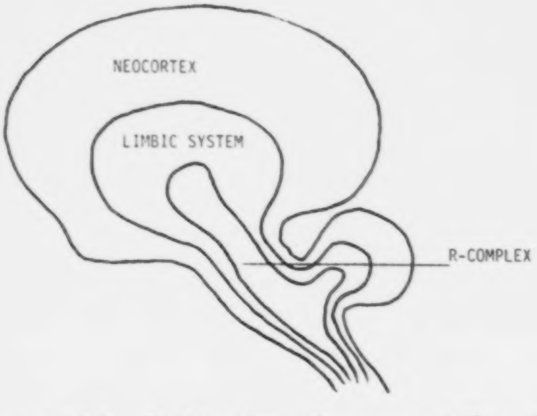

Figure 12-2. Highly schematic representation of the three portions of the Triune brain, after MacLean.

They "are said to be distinguished neuroanatomically and functionally, and contain strikingly different distributions of the neurochemicals dopamine and cholinesterase." (Sagan, 1977)

Our behavior may be determined by any one of these portions of the triune brain, depending upon circumstances, past experiences, and genetically-programmed survival mechanisms. MacLean's experiments indicate that the R-complex plays an important role in aggression, "territoriality, ritual and the establishment of social hierarchies" (Sagan, 1979). It appears that basic needs and sexual drive are programmed in this portion of the triune brain.

The limbic system apparently controls strong and vivid emotions, attitudes, prejudices, and motivations not tied to basic biological needs. It is in the limbic system tht hippocampus, which triggers long-term memory storage, is housed. The pituitary gland, also located here, controls the endocrine system. Imbalance in this system alters moods, which provides an important clue to the relationship between the limbic system and our attitudes and mental states. Malfunctions of the pituitary, amygdala, hippocampus and other limbic organs can lead to rage, fear, or sentimentality that have no readily-apparent cause (MacLean, 1973).

The neocortex, which virtually surrounds the limbic system (which in turn surrounds the R-complex), controls characteristically human intellectual functions. Logic and the quest for knowledge are apparently controlled by this portion of the brain, as are the anticipation of the future, anxiety, language processing and other indicators of intellect.

While short-term memory and the triggering mechanisms for long-term storage are primarily limbic-system functions, long-term memories are stored in all three portions of the triune brain. Each portion is the site for storage of specific types of information, related to the abilities of that particular portion: ritual in the R-complex, emotion in the limbic system, and reason in the neocortex. Similarly, selective attention to stimuli is controlled in the three areas by the abilities of each. For example, the R-complex will attend to the student's hunger during a class at 11:30 a.m., the limbic system will concentrate upon how the student feels about the instructor or subject matter, while the neocortex is attempting to process the cognitive information being presented.

The R-complex apparently has preference in most situations. That is, if a person is overly cold in a classroom, emotions and the quest for knowledge will take a back seat to the need for warmth. The need for sleep will also overcome the neocortex and the limbic system. If the R-complex's needs are satisfied, the limbic system then has preference over the neocortex. The hippocampus must be ready to accept new information, as stated previously, before long-term learning can occur.

Finally, if both the R-complex and the limbic system's needs are satisfied, the neocortex can function optimally. The interconnectedness of these three allows the neocortex, at times, to dominate; that is, for reason to predominate over emotional and basic needs. This seems to be a short-term victory, however. It is a rare person, indeed, who can set aside emotion, attitudes, and basic needs for long periods of time. Recall, if you will, the research on attention spans at various ages and levels of educational development which indicate that an attention span greater than 30 minutes is most unusual. Research also points out that adolescents and young adults are interrupted by "romantic thoughts" (love, sex) five to twenty times per hour. These research findings indicate the high priority of R-complex and limbic system functions, to the detriment of neocortical functions.

> MacLean believes that the people who are enamored of theorizing about the differences between the left (rational, verbal) and right (nonverbal, intuitive) cerebral hemispheres are missing the boat somewhat. 'I think they've got a lot of stuff maybe too high upstairs' - that is, many of the creative, emotional and spiritual impulses ascribed to the right hemisphere are more properly attributable to the limbic system. (Holden, 1979)

Kimura's research results, cited earlier, are in agreement with this, in that the hemispheres share in carrying out functions, albeit less equally than MacLean believes.

MacLean's model of a triune brain provides a few implications for instructional design, most of which are previously-stated tenets but are nonetheless important to review.

(14) For individualized self-study materials, the setting in which they are used is at least equally as important to learning as is the quality of content and design used to present the information.

Directions for use of self-study instructional materials should include suggestions for appropriate settings in which study may be most effective. If special equipment or other resources are to be used, this should be specified, along with information regarding where they are available, for how long they may be used, and other special circumstances which may impact upon the use of these resources. If the material can be used by pairs of students or by small groups for interactive study, directions should include suggestions for the most effective use of the materials in group discussion.

(15) Clarity reduces unwarranted anxiety.

Explicit directions, unambiguous learning objectives, sample test items, practice and review items, clearly-drawn diagrams with appropriate labels, worksheets, and clearly outlined and stated textual material tend to let the learner know exactly what is expected by the instructor or author. This frees the limbic system and neocortex from unwarranted anxiety about the requirements of the lesson or course.

(16) Examples used in instruction can effect the learner's attitude and mood. Effectiveness of examples may also be determined by the learner.

Examples which are clearly pertinent to the subject, or to the life-goals of the learner, provide a realistic backdrop for the information being learned. In many cases, the examples can draw upon esthetic appeal, empathetic situations or common positive personal experiences of the learners, all of which can have a positive influence upon the limbic system's view of the instruction. The affective portions of instruction must be attended to by the instructional designers so as to assist the learner in developing intrinsic motivation for storing the information in long-term memory storage. Developing a positive attitude toward learning the material, or at least avoiding the alienation of the learner, is important to hippocampal involvement in generating the proteins essential for long-term memory (O'Keefe, 1978)

SUMMARY

Over the past few years, research into brain function during information intake, learning, and recall has increased dramatically. Some of the recent studies were cited and discussed. The educational implications for the design of instruction are becoming somewhat clarified. Many of the tried-and-true instructional strategies are becoming somewhat clarified. Many of the tried-and-true instructional strategies are upheld by brain-function research, while other methods become questionable. Certain new strategies may become accepted as educational researchers investigate and validate them.

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Chapter 13

Cognitive Theory within the Framework of an Information Processing Model and Learning Hierarchy: Viable Alternative to the Bloom-Mager System

Robert J. Stahl

What do we know about human learning? Is the research literature on human learning now rich enough to support an alternative to Bloom's 1956 Taxonomy of Educational Objectives? The contention of this chapter is that we know far more about how learning takes place now than we did 25 years ago and that techniques and concepts which were acceptable at that time are no longer valid. The Stahl Perceptual Information Processing and Operations Model is proposed as a model of how thinking, memory, and the processing of information takes place within an individual. The Domain of Cognition is introduced as a system for identifying the sequence of thinking and processing likely to result in several different levels of learning.

Bloom's Taxonomy (Bloom et al., 1956) has dominated instructional design and evaluation for a quarter of a century. Programs at all levels of education use this Taxonomy as the major framework for planning, developing, implementing, monitoring, and evaluating instructional variables, both process and product, for both teachers and students. The popularity of this hierarchical model is evidenced by the entry of nearly 1,000 articles on the Taxonomy of Educational Objectives in Education Index between 1966-1978 (Clements, 1979). Furthermore, some teacher educators have even taught the Bloom System as a learning theory in its own right, giving the Taxonomy a status it was never intended to have.

Interestingly, the Bloom taxonomic system has been and is being used even though it is not consistent with any presently accepted theory, model, or approach to human memory, thinking, or learning (Stahl, 1979). Clements (1979) pointed out that three of the four major principles upon which the system was originally based were never supported by research. These initial problems have proved to be but the beginnings in the demonstration of weaknesses in the structure, levels, and sequence of the Taxonomy (Kropp and Stoker, 1966; Miller, Snowman and O'Hara, 1979; Smith, 1968, 1970; Poole, 1971, 1972; Seddon, 1978).

The intent of this chapter is not to provide a review of the literature concerning Bloom's Taxonomy. Instead, the reader will be introduced to an entirely new taxonomy, the Domain of Cognition, which was developed from the research literature on human learning. To support this hierarchical system, a model of how humans process information will be presented which forms a framework within which the synthesis of research in memory and learning can be considered and which provides a description of the flow of thinking, memory and learning as these occur interactively within instructional settings.

A by-product of using these two models was the development of a new set of criterion for writing specific instructional objectives. The specifications for writing these objectives are different from those proposed by Mager (1962). Following the presentation of the Domain of Cognition is an overview of a systematic approach to the identification, selection, and writing of specific objectives congruent with the approach to planning suggested by Stahl (1978).

INTRODUCTION TO THE MODELS

The Bloom-Krathwohl taxonomic domains were important contributions to all areas of education in that they provided a much-needed framework for considering learning outcomes. However, today the results of research on thinking, memory, and learning suggest that an entirely new frame of reference is needed for identifying and accurately classifying learning outcome behaviors.

Instructional design in the 1980s must be tied to a taxonomic model which is directly compatible with the results of learning research conducted on human subjects. The new Taxonomy would be more useful if accompanied by a model of how individuals process information, one which has the strong support of extensive research findings. This model should have the additional attributes of being content-free and unrelated to the structure of any discipline. They should also be compatible with such divergent learning theories as those proposed by the "Behavioral," "Developmental," "Cognitive," "Perceptual," and "Gestalt" schools of psychological thought.

Besides the obvious benefits related to the measurement of learning, the new information processing-taxonomy model would have advantages for teacher educators. They would allow teacher-educators to help pre-service and in-service teachers make sense out of the various learning theories presented in the literature. This is especially true for teachers who have been introduced to different models of learning which appear to be inconsistent with one another and which are incongruent with the Bloom taxonomic system, which these teachers have been expected to use for planning and evaluating instruction. Such a model would also help teachers to develop instructional strategies which would be likely to aid students in attaining the different levels of learning which have been established as their end goals.

To summarize, what is needed in the field of instructional design is:

a) a model or explanation of how information is accepted, treated, processed, and acted upon within the individual learner. Such a model must be consistent with research findings in which human subjects were used and would distinguish among thinking, memory and learning as separate yet interrelated aspects of human behavior;

b) a model (taxonomy) explaining the different types or levels of memory, thinking, and learning which is consistent with the information processing model cited above and which stands upon its own merits with sufficient research support;

c) a way of helping pre-service and in-service teachers separate pre- and post-learning behaviors within classroom situations;

d) a way of looking at memory, thinking, and learning which "makes sense" to teacher-educators and teachers and is compatible with an extensive body of literature related to human learning; and

e) a way of converting the internal operations of thinking, memory, and learning into observable process (i.e., in-class) and produce (i.e., outcome) behaviors (Stahl, 1980).

A system incorporating the points above would be worthwhile and practical from the perspective of the teacher-educator and of the pre-service and in-service teacher. Such a system is the Stahl Perceptual Information Processing and Operations Model (SPInPrOM).

THE STAHL PERCEPTUAL INFORMATION PROCESSING AND OPERATIONS MODEL (SPInPrOM)

The basic components and flow of the SPInPrOM model are provided in Figure 13-1. The features and characteristics of the operation of this model are explained below. The SPInPrOM model contains some components featured in existing information processing models. The explanation suggests a workable sequence for how this information processing model operates in determining what and how thinking and learning take place.

The order of the presentation below is based upon convenience and ease of understanding. As appropriate, additional items will be identified for comprehensiveness, completeness and readability. The intent of this description is to explain the ways in which an individual goes about thinking which may result in learning.

1. **Environmental Information.** The Environmental Information component serves to identify the external source of information to be confronted and handled by a person's processing system. This component is defined to include all the information and stimuli which are available within the life space of the individual. As stimuli, environmental factors vary in their power, direction, intensity, and strength. Some of these factors may influence or dominate the person's thinking and behavior. The individual ultimately decides which elements of the environment will be attended to, internalized, and processed.

2. **Preparation or Perceptual Set.** Although this aspect of information processing is not identified by any single component of the model, preparation plays an important role in the early stages of the entire processing operation. Sometimes referred to as "expectancy set," this mind set exerts considerable influence on how the learner attends to, receives, processes, and understands available and recently received information

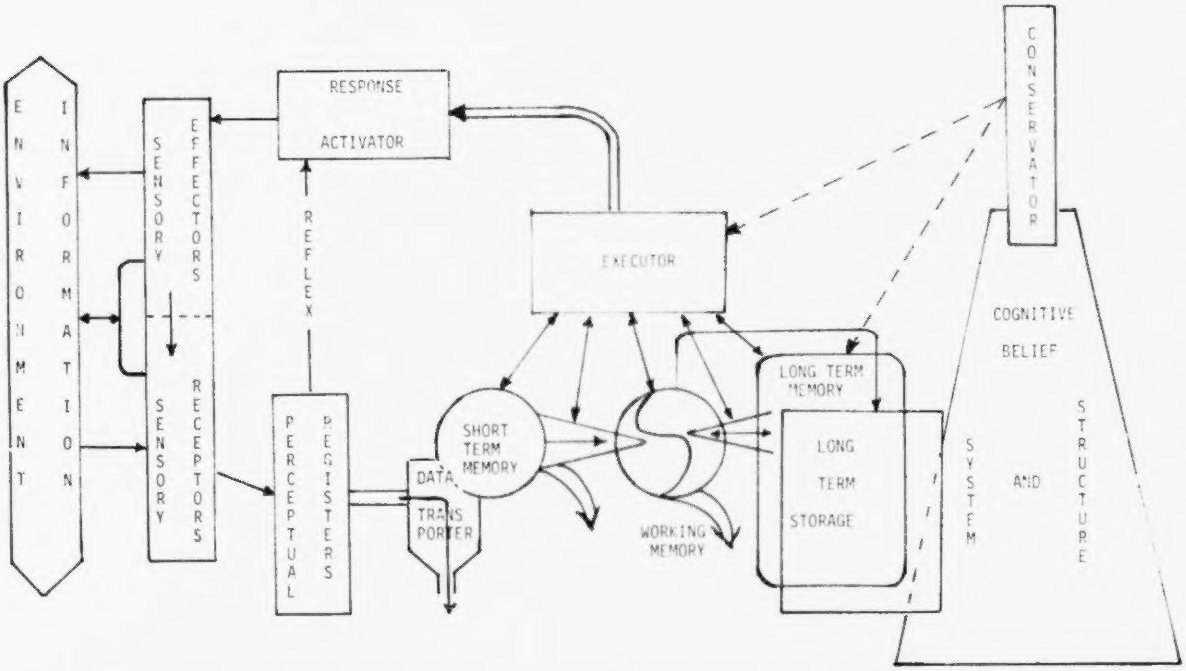

Figure 13-1. A diagram of the components, operations, and flow of activity within the Stahl Perceptual Processing and Operations Model—SPInPrOM (Copyright, Robert J. Stahl, 1979).

(Estes, 1972; Frase, 1977; Gagne and Rothkopf, 1975). A specific mind-set may or may not persist during an entire learning activity.

"Readiness," or preparation for information, plays a critical role in learning (Bloom, 1968; Ausubel, 1960; Neisser, 1976). In most situations the learner's personal motivations, learnings, and needs produce a powerful perceptual set (Gagne, 1976). These motivations prepare learners to expect certain environmental events and to view such events in ways consistent with their own motives and needs. At the same time, certain types of information (e.g., pre-and adjunct questions, advanced organizers) often alert learners to attend to, receive, process, and assign special meaning to about-to-be-presented information (Ausubel, 1960; Rothkopf and Bisbicos, 1967). This information suggests a "feed forward" feature of one's mind or perceptual set which acts in ways seemingly parallel to motivation-produced mind set.

3. **Sensory Receptors - Effectors.** Information in the environment is picked up by the individual's Sensory Receptors. These receptors include the physiological elements of the sensory system, including the organs and nerve networks of sight, sound, taste, smell, touch, as well as those physiological networks involved in the production of such internal phenomena as muscle pain, fatigue, and aches. Sensory Receptors pick up information from the environment and convert it into nerve impulses. Sensory Effectors, on the other hand, act upon the environment via internal response commands and are often identified with "selective attention" or "selective reception." For instance, the process of picking up and decoding sounds within the inner ear provides an example of Sensory Reception, the activity of directing the ear to deliberately "listen for" certain sounds in an example of a Sensory Effector at work.

This component of the model represents the interface points, where information from the environment is actually taken into (and by) the processing system. To be available for later processing, information must first be received.

4. **Perceptual Register.** The Perceptual Register picks up and momentarily records the kinds of information associated with an entire "perceptual system" rather than that which is picked up as independent perceptions by each of the individual sense organs (Gibson, 1966). For example, a total "aural perception" is recorded, rather than separate perceptions from each ear. Several "perceptual systems" exist and function within the body, and the Perceptual Register functions to integrate these into a total perceptual system.

The learner is capable of preserving the information (e.g., an image contained in the Perceptual Register for a few milliseconds after the external information is no longer available to the Sensor Receptors. While the capacity of the Perceptual Register apparently is quite large, information is held by it for only a few milliseconds.

Information not placed in the Perceptual Register is no longer available for processing by the system. Further, a part of the information which has been placed in the Perceptual Register fails to survive those encoding operations which are necessary to translate it into a form which can be used by later stages in the information processing system. Hence, information can be lost at two points; information gathered by a perceptual system may never enter the Perceptual Register, and information within the Perceptual Register may never survive translation and transmittal to the next stages in the information processing system (the Data Transporter and the Short-Term Memory) (Haber, 1970).

Certain types of sensory information which reach the Perceptual Register are automatically converted into messages which activate an immediate behvavior response. Sensory data which require an immediate response (e.g., a hand on a hot stove) are identified as such during registration (i.e., reflex action required). A message is then immediately sent to the Response Activator, directing it to activate an appropriate "reflex" (i.e., pull the hand away).

5. **Data Transporter.** Information passing through this transporter mechanism must receive immediate attention or its specifics are quickly lost. In this component, information not attended to is presented and then rapidly "pushed out" within a few seconds. Information which is "pushed out" is lost to the memory and all later processing stages. However, information which is attended to may be preserved and remembered for longer periods of time. Unfortunately, the Data Transporter is often equated with Short-Term Memory rather than being seen as the data conveyor operation that it is.

6. **Data Surviving in the Data Transporter.** Information flowing through the Data Transporter will remain for a short period of time (i.e., a matter of seconds) and is then discharged (Baddeley, 1972). The processing system operates to instantly decide where this information is to go from here, and in what form. These decisions determine what will be retained verbatim, whether the "gist" of the message is enough to remember, and/or what other actions may be called for in dealing with the information. If the information is deemed meaningful in some way, a "memory trace" of the general "gist" of this information is produced within the Short-Term Memory. Unless motivated to do otherwise, the tendency of the system is to allow the specific details contained in this information to be lost (Berelson and Steiner, 1964).

7. **Short-Term Memory.** Short-Term Memory includes those aspects of recently received information which can be remembered. In contrast to the Data Transporter, which serves an extremely short "data flow" function, Short-Term Memory serves a "recollection-remembrance" function. This memory operation tends to retain general features of recently received information while often allowing the details to be lost. However, attention directed to retaining these details aids this mechanism to remember them as well.

The capacity of the Short-Term Memory is relatively small - apparently limited to 7 ± 2 discrete items (Miller, 1956). However, Miller found that this capacity can be greatly expanded, functionally, by transforming discrete units of data into meaningful conglomerates through operations called "chunking" and categorizing. These operations involve retaining the information over an extended period of time, and so cannot occur in the Short-Term Memory; "chunking" and categorization are operations occurring in the working Memory. In the absence of interference, information can be transformed from the Short-Term Memory to the Working Memory, "chunked," rehearsed and transformed. However, if interference is present, sufficient attention may not be available for this transference and transformation to occur. When this is the case, the information contained within the Short-Term Memory "fades" or "decays" rapidly after only a few seconds, resulting in as much as a 90% loss after only 18 seconds (Broadbent, 1963, 1971; Peterson and Peterson, 1959).

Information reaching this far into the system has already begun a process of transformation or translation into a form which has meaning for the learner. This transformation may produce alterations, incompleteness, inaccuracies, and/or distortions with respect to the originally presented information, so that it becomes more compatible with what the system already knows and/or expects. Unless feedback is received which tells it otherwise, the system will accept this transformed information as being equivalent to the information originally presented by the environment.

8. **Executor.** Before examining the Working Memory, it is appropriate to introduce the Executor. The Executor is the administrator of the entire information processing system. To do its administrative tasks, the Executor operates to:

   a. **assign meaning** to recently encountered and received information. This includes influencing the Sensory Receptors, Perceptual Register, and the encoding of data as it enters the Data Transporter. In effect, it assesses, reduces, modifies, and to some degree censors information entering the system (Prokasy and Hall (1963) in Ellis et al., 1979).

   b. **assign meaning** to ("making sense of") information in the Short-Term Memory and Working Memory. This includes deciding what this information "means" in terms which the learner can understand (i.e., in terms which "make sense" to the learner.) (Flavell, 1977; Martin, 1971; Postman, 1968).

c. **decide what information will be retained** within the system as well as **how** it is to be used, transformed, retained, and stored. Such decisions involve recently received information as well as information from long-term storage (Greeno in Gregg, 1974).

d. **direct the functioning** of other components of the memory system (i.e., Short-Term, Working, and Long-Term Memories) and their interactions (Krech et al., 1974).

e. **decide how much influence** the learner's Cognitive-Belief System will have in formulating the meanings to be assigned to new and recently received information. It also identified the alternative responses open to the learner (Allport and Postman, 1945; Salomon, 1979; Tulving, 1962).

f. **decide how the learner will respond** within a given environment and situation. The Executor notifies the Response Activator as to which behavior has been decided upon. This message identifies the type and kind of response to make in the given situation (Ellis et al., 1979).

g. **direct the internal thinking operations** within the system responsible for conscious thought, processing, and related activities (Cofer, 1973; Berelson and Steiner, 1964).

In summary, the Executor directs the inner functionings of the memory-storage-response system, which in turn, ultimately controls what is learned, how it is stored, and how one will respond. As a general rule, the Executor is greatly influenced by previous experiences as these have been encoded in the learner's own Cognitive-Belief System. Hence, there is an overwhelming tendency to perceive and transform new information so as to fit the individual's existing "world view." Decisions as to the relevance of information to the learner are made by the Executor within a context established by the Cognitive-Belief System.

The Executor decides what information will be transferred into Working Memory (Crowder, 1976). It also determines how this information will be transformed and handled within this particular memory component. In carrying out this and many of its other functions, the Executor seems to operate outside the conscious control of the individual (Shevrin and Dickman, 1980).

9. **Staying Alive in Memory.** The life span of recently received information within the processing system up to this point has been measured in terms of seconds. Information which is to be "learned" must be retained for much longer periods of time. The longer information is kept "alive" within the memory system, the more likely it will be stored for later retrieval. Therefore the learner must take active steps to extend the "lifetime" of information to be learned. One way in which he can keep information alive is by "rehearsing" it in various ways in conjunction with other new information and with previously--stored information from the Long-Term Memory.

The primary purpose of "rehearsal," or practice, is to enable the learner to understand the meaning, message, intent, value, and/or uses of information in relationship to other information already or just being processed. Extensive rehearsal takes place within Working Memory, which allows interaction between the Short-Term and Long-Term Memories. During this operation, the information as transformed is being personalized and further internalized in a form which makes personal sense to the learner (Wittrock, 1979; Salomon, 1979).

10. **Working Memory.** Working Memory provides the arena in which newly received information actively interacts with information obtained from the Long-Term Memory (Wittrock, 1979; Shifflin and Geisler, 1973). This interaction tends to "field test" the new data to determine how it might fit into the Long-Term Storage-and-Memory system. The greater the apparent consistency of the new information with long-term memories, the more likely it will be found meaningful and hence be filed for rapid retrieval in Long-Term Storage. The solution of problems through the application of information from Long-Term storage and of recently received information takes place within the Working Memory.

Information reaching Working Memory includes that recently received information which has been kept alive for further processing through rehearsal. At this time, information tends to be further transformed into the types of data which has meaning for the learner in light of previous understandings and experiences (Greeno, 1973; Lindsay and Norman, 1972; Gagne, 1976). If there is a need to retain this information in Long-Term Storage in the form in which it was originally received, then this rehearsal is referred to as "memorizing." However, the most common tendency of Working Memory operations is to transform the new information into "impressions" or "generalizations" which the system equates with the originally given information (Wittrock, 1979; Neisser, 1976).

11. **Consolidation and Storage.** An "attention span" is the period of time during which information contained in the Working Memory is held before it is sent into Long-Term Storage or is "unloaded" from the system. The "attention span" varies across learners and across situations for the same learner (Posner, 1969). The length of these spans appear to be unconsciously regulated, possibly by the Executor. At the termination of a span, information is either encoded and stored in Long-Term Storage for later retrieval, or it is 'dropped' from the system as if it were never encountered.[3] The more important it is for the newly received information to be retained for later use in thinking, the more necessary it is for consolidation to occur before the attention span ends.

Under certain conditions, individuals are capable of carrying information over from one span period to the next. This ability gives the appearance that the Working Memory component has "elastic qualities," i.e., it acts as though it has "stretched" its capacities to accommodate information processing across attention span periods.

The learner does not consciously control what will be stored nor how it will be retained. However, the learner can influence the likelihood of the storage and later retrieval of the information by performing operations designed to achieve the conditions listed below. Information is more likely to move from Working Memory into Long-Term Storage,

a. the more meaning the system has attached to that information,
b. the more it has been appropriately transformed and rehearsed,
c. the more it relates to other information already in Long-Term Memory either by comparison or by contrast, and
d. the greater the "quality" of the consolidation which takes place immediately prior to the close of the "attention span."

Unless motivations and perceptions function otherwise, the results of the encoding-to-storage operation tend to support previous generalizations and impressions (or schemata) which the learner already possesses, while tending to store specific details in cognitively remote locations (Conrad, 1964; Sachs, 1967). In most situations where new information has been encountered by the learner, its consolidation in Working Memory is necessary to help ensure its transfer into Long-Term Storage (Bauman and Glass, 1969).

12. **Long-Term Storage.** Long-Term Storage should not be equated with Long-Term Memory. The information contained in Long-Term Storage is extensive, detailed, and somewhat permanent (Loftus and Loftus, 1980). While there is a theoretically limitless amount of such storage space, it seems that once information is stored in Long-Term Storage, there is a great deal that appears to get "lost." A transfer-to-storage operation encodes the data from Working Memory and files it as is appropriate. Such encoding and filing is beyond the conscious control of the learner (Shevrin and Dickman, 1980).

13. **Retrieval and Learning.** Information which can be recovered from Long-Term Storage and used is information which has been "learned." This recovery is required by the definition of "learning," since it suggests that the information is available over time for use in thinking and directing behavior. The degree of stability of this thinking and behaving across time periods is an indication of how well the information was originally learned. This retrieval operation produces information for use by the learner as its need arises in a given situation. Higher forms of thinking-learning all require later retrieval, but this retrieval is **not** restricted to just how much one can recall. These higher forms are characterized by how well the learner can use **retrieved information** to guide thinking and behavior without having to take time to "think about," or re-process, the information before using it. Thinking and behaving guided by the learner's Cognitive-Beliefs are indications of higher level thinking and behavior.

14. **Long-Term Memory.** Long-Term Memory includes that which the learner "remembers about what is stored." This memory component also directs "how" stored information is remembered. This memory component, and not Long-Term Storage, directs the retrieval operations of searching, locating, recovering, organizing and reconstructing information stored in Long-Term Storage.

The data retrieved from Long-Term Storage via Long-Term Memory may be accurate in many details. But frequently, material seems to be fabricated (invented) by the information processing system at the time that the memory reports its findings. Thus, fabricated information is often supplied in place of information missing in Long-Term Storage in order to present a reasonably complete and consistent "memory" (Berelson and Steiner, 1964; Loftus and Loftus, 1980). "Forgetting" (or the failure to retrieve accurate, complete, and/or detailed information from Long-Term Storage) appears to be a failure of the retrieval operation of the Long-Term Memory rather than a failure of the storage system.

15. **Utilizing Retrieved Information.** Both information and instructions for its use in guided thinking are retrieved by the Long-Term Memory. Since this is "learned information," the memory system operations involved in making sense of and thinking through newly received information are learned operations. This learned information and these learned operations are constantly being used in Working Memory to assist the learner to 'comprehend' and to 'personalize' new information. As a general rule, the memory system uses learned information to make the new information compatible with that which is remembered and retrieved via Long-Term Memory. Seen in this way, the degree of "relevancy" assigned to new information depends upon the number and kinds of associations which can be made between this new information and previously stored information.

16. **The Cognitive-Belief System.** The Cognitive-Belief System is generated out of the Long-Term Storage-and-Memory System. It is an organized framework which functions to separate, departmentalize, structure, and develop hierarchial arrangements of the major ideas, guidelines, beliefs, and generalizations which the learner abstracts from and synthesizes about the universe in which s/he lives. These 'cognitive-beliefs' focus on the learner as a person (i.e., the Self) as well as the relationships s/he has with the World-Outside-Self.

The Cognitive-Belief System contains the learner's world-view, values, beliefs, and attitudes, as well as those ideas and generalizations which are used to make sense of personal experiences.

As a general rule, the Cognitive-Belief System operates through the Conservator to influence the entire system in such a way as to cause it to "see" and "understand" things in ways which are consistent with the existing world-view and the perceived Self.

17. **Conservator.** The Cognitive-Belief System exercises its influence toward conformity through the Conservator. This Conservator exerts a strong influence on the Executor and upon Long-Term Memory operations in order to ensure that information is retrieved and/or processed in ways consistent with the learner's previous perceptions and existing world-view. While the Conservator does not control the Executor or the Long-Term Memory, prior reinforcements and repeated similarity in experiences allow these components to be easily influenced by the Conservator. In essence, the Executor is quite "gullible" with respect to the influence exerted by the Conservator. This explains why individuals almost always interpret both new experiences and past memories in such a way as to produce conformity with their present world-views.

18. **Influence on Behavior.** Not only do previous learnings and the Cognitive-Belief System influence thinking within the Working Memory, they also provide the Executor with data about alternative or needed behavioral responses and/or performances. This information informs the Executor, which then uses the information in order to reach a decision. Should the situation and the content of the information call for a habitual pattern of response or for routine behaviors, the Executor allows existing Cognitive-Beliefs and Long-Term Memories to operate with a relatively open, automatic hand in directing the response. Learned information may also be used to influence what is attended to, selected, and/or rejected during the early stages of the processing operations.

19. **Response Activator.** The entire nervous system functions as the Response Activator in responding to a given situation. This component receives orders from the Executor as to what the response will be and then directs the various physiological systems (e.g., muscles) to carry out the order. The Perceptual Register can also send directives to this Activator, by-passing the Executor by initiating what is called a "reflex action."

20. **Sensory Effectors.** Sensory Effectors are the sense organs, muscles, and other physiological components which respond to the orders transmitted from the Executor by way of the Response Activator.

21. **Feedback-Feedforward.** A behavior or thought generated by the learner is supported or rejected either in whole or in part as a result of the information which is received into the processing system concerning that thought or behavior. If a particular guideline is used in generating that behavior or thought, and if that thought or behavior produces positive results (positive feedback) for the learner, that guideline is likely to be used again in similar situations. Negative results provide 'feedback' as to what did not work, as well as 'feedforward' about what probably won't work or should be avoided in the future. Information derived from the environment's responses to the learner's behavior must be received by the Sensory Receptors and this newly received and processed information begins its journey through the system (Wittrock, 1979).

A Note on the "Ecological Validity" of the SPInPrOM Model

These phases, components, and operations possess "ecological validity" in that they provide a practical and realistic overview of how individuals process information within their natural environments (Neisser, 1976). Findings from empirical research using human subjects and conducted in the natural environments of the learner support the model. Of equal importance is the fact that teacher-educators and teacher-trainees have reported that the SPInPrOM model explains how students as well as they themselves, are likely to think, behave, and learn within and outside classroom settings.

THE DOMAIN OF COGNITION

As shown by the SPInPrOM model, information presented to be learned undergoes a great deal of processing on its way through the system. In some cases, what happens to this information is not what the teacher would like to have happen. Now that these processing events are familiar to the reader, it seems appropriate to introduce a sequence which has more direct application for considering outcome-of-instruction behaviors. This sequence takes the form of a taxonomic system entitled the Domain of Cognition.

The Domain of Cognition includes eight levels of cognitive and cognitive-affirmative thinking and other learning-related behaviors (see Figure 13-2). This Domain also includes two 'pseudo levels' which point out where two crucial learning-related activities take place within this explanation of the thinking-learning continuum. Within this system 'thinking' is defined as "any mental activity" while learning is defined as "acquiring a new thought or behavior which will be **retained, maintained** at a reasonably stable level, and **demonstrated** in similar situations across time." Thinking may result in learning as well as in the incorporation of previous learning, but it is not to be equated with learning. The Domain of Cognition includes pre and post learning levels of thinking which operate within and may result from classroom instruction. One advantage of this taxonomy is that it helps teachers to view the entire range of thinking-learning activities likely to occur during and as an outcome of instruction.

The levels of the Domain of Cognition described below identify the sequence of processing information for thinking and learning from an in-

Figure 13-2. An outline of the major levels and sublevels of the Domain of Cognition.

THE DOMAIN OF COGNITION*

1:00 **PREPARATION**

"OBSERVATION" (input of new information)

2:00 **RECEPTION**
  - 2:10 Literation
  - 2:20 Recognition
  - 2:30 Recollection

3:00 **TRANSFORMATION**
  - 3:10 Personalization
  - 3:20 Adaptation

"INFORMATION ACQUISITION"
(Encoding and storage of information into Long Term Storage)

4:00 **RETENTION**
  - 4:10 Recoginition
  - 4:20 Recollection

5:00 **CUEPLICATION**
  - 5:10 Replication
  - 5:20 Variation

6:00 **TRANSFERSION**
  - 6:10 Replication
  - 6:20 Variation

7:00 **INCORPORATION**
  - 7:10 Replication
  - 7:20 Variation

8:00 **ORGANIZATION**
  - 8:10 Organization
  - 8:20 Personation

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*Robert J. Stahl (c., 1981). Arizona State University, Tempe, AZ 85287

structional viewpoint. This taxonomy is not a modification of the Bloom-Krathwohl systems. It is an entirely new system and should be seen as such. And although the Domain of Cognition is related to the SPInPrOM model, the reader is advised not to look for an exact one-to-one correlation between components of these separate models.

Progressing Up the Levels of the Domain of Cognition

The eight levels and two "pseudo" levels of the Domain of Cognition are presented below in sequence from the lowest to the highest levels. The Domain of Cognition can be used as a 'model of thinking' with reference to types and sequence of Cognitive operations and a 'model of educational outcomes' describing specific behaviors which may result from instruction. These levels are described below in terms of educational outcomes. (See Figure 13-2).

Level 1:00 PREPARATION. Preparation is defined as those behaviors which demonstrate that and/or how an individual is expecting, ready to act on, or ready to receive information and experiences about to be presented to him/her in a given situation. The behaviors at this level demonstrate the readiness or expectations an individual has immediately prior to or at the moment of encountering new information, situations, or stimuli.

First Placebo Level: OBSERVATION. This placebo level is included to indicate where the actual intake of external information occurs within this sequence of thinking-learning. This level is added for completeness. Information not taken in or "observed" via the senses is not available to the learner for later processing, thinking, or learning.

Level 2:00 RECEPTION. Reception is defined as those behaviors, events, and test situations which demonstrate that information immediately available to or that has just been made available to the individual has been taken in (i.e., mentally received) by the individual in much the same way it was presented. The individual gives evidence that information was taken in near verbatim form as originally given with no intentional effort to change the form, meaning, or content of the information. These behaviors include evidence of remembering information which was just presented to or which was newly thought of by the individual within a short time frame of a class period, experience, or situation. Hence, remembering information for a few seconds, a few moments, an hour or two and recalling it would be evidence of this level of behavior.

Level 3:00 TRANSFORMATION. Transformation is defined as those behaviors, events, and test situations which demonstrate how an individual has revised, modified, or given meaning to verbatim information just received. In essence, the individual demonstrates how he/she has comprehended or translated recently received information into terms, phrases, uses, or actions which give evidence of the sense (or meaning) the information has for that individual from his/her own perspective. Thus, the individual uses behaviors which demonstrate "this is what this information means to me."

Second Placebo Level: INFORMATION ACQUISITION. This second placebo step in the sequence operates beyond the conscious control of the learner. Added for completeness, this step identifies where the acquisition, encoding, and storage or recently transformed information from Working Memory into Long-Term Storage following the close of an "attention span" occurs.

Level 4:00 RETENTION. Retention is that level at which the learner demonstrates the ability to search for, locate, and recover information stored in long-term storage via long-term memory.[5] This ability to recover information when necessary from long-term storage provides evidence that learning, at least at minimal level, has occurrred. (Note: As pointed out in the SPInPrOM Model, information received by the learner during a given class period and recalled and used from the short-term and/or working memories is not evidence of successful learning. Learning is dependent upon retrieval from long-term storage--a phenomenon which cannot be measured during the class period in which the information is first received.)

"Recognition" is the lower of the two sub-levels of retention. Recognition behavior requires the learner to retrieve sufficient information to enable her or him to decide whether a particular set of data has been experienced previously (e.g., multiple-choice or matching test items). On the other hand "Recollection," the other sub-level, requires the learner to recover information form storage in order to complete or fill in gaps of missing data (e.g., completion or fill-in-the-blanks test items).

Level 5:00 CUEPLICATION. Cueplication is defined as those behaviors, events, and test situations which demonstrate that the individual **can use** (or, **can apply**) principles, rules, etc., given 23 hours or more earlier in current situations or to problems when he/she is directly instructed (or 'cued') to use that particular principle, rules, etc., in that circumstance. On this level, the individual's decision to use a particular principle or rule is directed by some external source regardless of whether the individual could 'read' the signs embedded in the problems or situation which also serve to cue him/her as to what principle or rule is to be used.

Level 6:00 TRANSFERSION. Transfersion is defined as those behaviors, events, and test situations which indicate that the individual **will apply** principles, rules, etc. given 23 hours or more before to current situations or problems without any external source directing him/her to use particular information in that circumstance. On this level the individual on his/her own (1) "reads the embedded cues" given in the problem or situation, (2) recalls the appropriate principle, rule, etc. without outside direction, and (3) voluntarily applies this information in resolving the problem or situation.

Level 7:00 INCORPORATION. Incorporation is defined as those behaviors, events, and test situations which indicate that the individual applies in an automatic, almost habitual manner principles, rules, etc. to problems or situations where its use is seen by the individual as appropriate. To achieve this level, the individual has previously rehearsed the use of a particular principle, rule, etc. so often that its application to a problem or situation is now automatic. In other words, the behavior has become a habitual thought pattern, idea, response such that the person never really consciously considers what is guiding his/her behavior at that time. For example, the instant that one no longer consciously pays attention to all the steps in driving a car but does in fact drive the car by habit, this level of behavior has been achieved. Such behavior required the application of practical information as demonstrated via spontaneous behaving as a result of prior practice. On this level, the individual has a more internalized grasp of the information in this "abstract" nature.

Level 8:00 ORGANIZATION. Organization is defined as those behaviors, events, and test situations which reveal how the individual has arranged, organized or prioritized information as part of his/her cognitive-belief system. Behavior at this level is the individual's expression of how his/her own ideas, beliefs and understandings fit into his/her cognitive-belief system as an organized system. This behavior required the individual to give evidence of how particular principle, beliefs, values, rules, etc. are structured within the framework of his/her existing cognitive-belief system.

One of the more unique features of the Domain of Cognition is its avoidance of the use of specific processes (e.g., Application, Analysis, and Synthesis) as the basis for determining which are the "higher" and which are the "lower" levels of thinking and learning. The findings in cognitive psychology reveal that the level upon which thinking and behavior occurs is related to the degree to which one has internalized and uses rules to guide thinking. It is **not** the process itself which determines the "highness" or "lowness" of the level of thinking; rather, it is the level one has acquired and internalized the rules which one uses to guide the various processes which determine the appropriate level of one's thinking (Segal and Stacy, 1975).

Consistent with this research literature, the Domain of Cognition describes a sequence of degrees (or levels) to which information and rules may be internalized and used by the learner. Figure 13-3 illustrates 21 separate mental operations or ways which individuals may use rules in thinking and responding. Each mental operation or **uniprocess** represents a distinct way the learner can make use of rules or guidelines which have been acquired. So-called "complex processes" or **megaprocesses** are defined as 'complexes' or combinations of uniprocesses which are used to respond to a single situation or problem.

Therefore, it is possible for learners to use the same uniprocess on any one of several different

Figure 13-3. The twenty-one uniprocesses.

UNIPROCESS NAME	MAJOR ACTIVITY OF THE UNIPROCESS	FUNCTION OF THE UNIPROCESS[1]	COMPLEMENTARY ACTIVITIES
1. Association	Associating	joining or tying two or more items together with the emphasis on the conjunctive aspects rather than on the whole	Affiliating, Connecting, Interrelating, Relating, Tying
2. Classification	Classifying	forming groups and/or putting items into categories	Categorizing, Grouping, Ordering, Sorting, Systematizing
3. Combination	Combining	putting separate items or information into some single whole	Blending, Chaining, Compiling, Integrating
4. Comparision	Comparing	identifying what and/or how items are similar to and/or different from one another	Contrasting, Equating, Likening
5. Condensation	Condensing	producing a shortened version of some longer form of information	Abbreviating, Abridging, Consolidating, Simplifying, Summarizing
6. Conversion	Converting	changing the external or internal features, size, etc. of an item or information for the purpose of making it different	Altering, Changing, Deviating, Modifying, Revising
7. Description	Describing	reporting the features, number, etc. of the external aspects of information or an item	Announcing, Narrating, Reporting
8. Designation	Designating	assigning a label, name or exactness to an item	Naming, Defining, Labeling, Specifying
9. Discrimination	Discriminating	treating items or information differently from one another	Differentiating, Discerning Distinguishing
10. Extension	Extending	providing information which would likely fill a void in the information which is available or being considered	Appending, Concluding, Conjecturing, Estimating, Projecting, Completing
11. Extraction	Extracting	taking apart or away from a larger whole to focus on its parts and their relation to each other and/or to the whole	Abstracting, Analyzing, Assuming, Deriving
12. Interpretation	Interpreting	making sense of information in terms of the meaning it has	Conceptualizing, Opining, Perceiving, Personalizing
13. Organization	Organizing	putting spearate items together in some interrelated order or sequence with the stress on the interrelationships as well as the order and system	Adjusting, Arranging, Assembling, Composing, Sequencing, Structuring, Systematizing
14. Proposition	Proposing	suggesting or providing a probable way of dealing with a situation or problem	Hypothesizing, Planning, Recommending, Theorizing
15. Reconciliation	Reconciliating	putting apparent opposition items or information together so that they form a compatable or consistent whole	Accommodating, Arbitrating, Balancing, Compromising, Conforming, Equalizing
16. Selection	Selecting	making a preferred, imperative, or needed choice	Choosing, Deciding, Determining, Judging, Picking
17. Separation	Separating	taking apart information and/or a whole to identify its distinct individual parts with the focus on the spliting of the parts from each other	Breaking, Disconnecting, Disuniting, Dividing, Segregating, Severing
18. Translation	Translating	putting information into a different form or version than it was originally given without deliberately changing its message, meaning, or intent	Coding, Decoding, Defining, Paraphrasing, Restating, Simulating, Substituting, Symbolizing, Transforming
19. Utilization	Utilizing	demonstrating how information or an item could be, is being, or has been put to use	Applying, Employing, Fitting, Transferring, Using
20. Valuation	Valuating	assigning value, a rating, or priority to an item or information	Appraising, Appreciating, Assessing, Evaluating, Judging, Prioritizing, Ranking, Rating
21. Verification	Verifying	specifying how information has been or is to be accepted as valid, true, reliable, or accurate	Authenticating, Confirming, Proving, Substantiating, Supporting, Validating

[1] Functions listed are illustrative and are not to be treated or considered as inclusive.

Note: The numbers are nominal and do not represent order of priority or importance.

levels of thinking and learning (i.e., Transformation, Cueplication, Transfersion, Incorporation, and Organization). Teachers must learn to focus their attention on helping learners increase the degree to which they internalize rules which can become the basis for higher levels of thinking. They must also abandon their belief that it is the process itself rather than the degree of the internalization which determines whether an outcome is the result of a "higher" level of thinking and behavior. Finally, teachers should consider the act of "processing" information as equivalent to "rehearsal time," during which the learners are practicing putting the rules and guidelines to use, thus increasing the likelihood that these rules will be acquired and further internalized.

The above represents a brief description of some of the major features of the Domain of Cognition. Preservice and inservice teachers at Arizona State University are currently using this taxonomic system as a basis for identifying and writing specific behavioral/instructional objectives. They are also developing test items for measuring the various outcome behaviors associated with these different levels. With these uses and attributes, the Domain of Cognition represents an important new addition to the field of teacher education and is a viable alternative to the taxonomic models presently being used.

SOME PRINCIPLES OF LEARNING AND THINKING

In reflecting upon the SPInPrOM and the Domain of Cognition models described above, the following list presents useful principles for instructional designers and teachers to consider in planning for and assessing the outcomes of instruction:

a. The individual learner is confronted with so many specific details in the environment that it is a wonder that as much detail is eventually stored in and retrieved from Long-Term Storage as in fact is (Deese and Hulse, 1967).

b. The processing system has a general tendency to deal with and produce generalizations and impressions of what information was received, rather than to retain the specific details of this information (Crowder, 1976; Kolers, 1974; Sachs, 1967).

c. A learned behavior is impossible to confirm at the time new information is first encountered, even though one's performance might suggest otherwise. The classroom teacher should follow the general rule of waiting 24 hours until the next class period begins before attempting to measure what can be **retrieved** and used via Long-Term Memory. This 24-hour period has precedence in learning-memory research. (Postman and Rau, 1957; Deese and Hulse, 1967). Learned behavior **cannot** be demonstrated during the class period in which information exhibited by this behavior was first received.[6]

d. There is no inherent difference between information useful for guiding cognitive thinking and learning (e.g., geometric theorems) and information useful for guiding affective thinking and learning (e.g., reasons for making moral decisions). It is the society, culture, institutions, etc. which attach special meaning to such information and give the appearance that values, moral beliefs, and affective, and/or normative-oriented information do possess inherent qualitative features. The learner actually deals with cognitive guidelines (e.g., how to read a map) the same way as affective guidelines (e.g., do unto others as you would have them do unto you) within the information processing system.

e. The learner continually uses and is influenced by information and understandings from her/his own Cognitive-Belief System and Long-Term Memory, which in turn operate to assist her/him to transform, select, make sense of, and assign meaning to new experiences and data (Samuels, 1974). By and large, the entire information-processing system tends to translate new information and experiences in such a way as to make them conform to and compatible with one's existing Cognitive-Belief System and Long-Term Memories.[7]

f. The individual uses rules as the basis for guiding his/her thinking and behavior. The critical role rules (or guidelines) play in psychological processing must be understood by teachers (Segal and Stacy, 1975). Rules or guidelines also provide the basic explanations, reasons, and basis for behavior (i.e., one behaves because of the operation of certain guidelines at the time of his/her behavior) (Katona, 1940; Postman, 1954; Segal and Stacy, 1975; Zeiler, 1963).

g. The use of a rule or guideline by a student does not necessarily mean s/he can identify (at least beforehand) what the rule is (Erickson and Jones, 1978; Wason and Evans, 1975). At the same time, recalling or stating a rule does not necessarily mean one understands it nor can use it (Erickson and Jones, 1978). Furthermore, the learning of information as information is different from learning information as guidelines and using it in this way (Gagne and Briggs, 1974).

h. The individual tends to apply a given guideline only in those situations which contain certain **specific** cues which were originally associated with that guideline during its learning. The more these cues and situations appear in association during initial rehearsals and the more the individual is reinforced for using the guidelines with these and only these cues, the less likely the individual will be able to **transfer** these guidelines to new situations at later times (Berelson and Steiner, 1964). Transfer of learning implies the transfer of guidelines originally associated with one type of situation to other situations where their use is appropriate but not necessarily previously evident to the individual.

i. The consistent and sometimes contradictory research findings related to the effects of external cues, stimuli, and reinforcers suggest very strongly that the effects of these external variables are learner-determined and not externally determined (Wittrock, 1979).

j. The individual learner operates frequently on two different "levels" of thinking and the processing of information. The retrieval and use of information via Long-Term Memory for use in working with recently received information represents higher level thinking while mental activities utilizing only recently-received information represent lower-level thinking.

The SPInPrOM model and the Domain of Cognition are supported by extensive findings related to human learning research and possess ecological validity from the perspective of inservice and pre-service teachers. These two systems are compatible with a wide variety of apparently divergent schools of psychological thinking. Both also represent feasible models for differentiating among the internal aspects of memory, thinking and learning. Both models also lend themselves to explaining external behaviors as they are occurring and as they may be identified as outcomes of instruction. Finally, these models are "teachable" within the framework of teacher education programs, and they are "learnable," especially SPInPrOM, in that inservice and preservice teachers are able to understand and use them, within a very short period of time.

MOVING FROM TAXONOMIC LEVELS TO IDENTIFYING INSTRUCTIONAL OUTCOMES

The Domain of Cognition was originally developed as part of an entirely new framework for use in planning, implementing, and assessing instruction which would be appropriate for all content areas and grade levels (Stahl, 1978). This framework provides a logical and sequential series of steps leading from the identifying of a unit focus to the specifying of relevant terminal, performance objectives. Within this system, the Domain of Cognition is to be used to identify specific behavioral outcomes of instruction much as the Bloom-Krathwohl models are being used at the present time. However, the components of specific objectives are somewhat different than those proposed by Mager (1962) and others. At the same time this new taxonomic model can be used within existing curriculum and/or evaluation systems. (See attached footnote).

To appreciate the role of this taxonomy and the value of planning instruction and writing specific objectives within the new approach proposed by Stahl (1978), a brief overview is provided below.[8]

The teacher starts the unit with a specific idea, generalization or principle that is identified as the single most important knowledge students are to acquire, comprehend, and utilize as a result of all the instruction during the unit. Put in another way, this "focusing statement" is the single most important understanding students are to achieve even if they were to forget all the specific data introduced during the entire unit. An example of a usable focusing statement is:

> "As individuals or groups move into a new territory, their lifestyle and the lifestyles of those who are already there are likely to change."

Once the unit focus is specified, the teacher begins to extract from the idea the kinds of information students will or may need to know in order to fully comprehend this single statement. As the process takes place, an extensive list of 50 or more "learning needs" is identified for the unit. Some "learning needs" generated from the focusing statement above include:

a. What is meant by a lifestyle?
b. How can lifestyles change?
c. Who determines what changes will take place?
d. How can individuals or groups move into a new territory?

(Following the guidelines for generating "learning needs," this list could easily exceed 50-75 separate items.)

One of the outstanding features of this listing is that it identifies no specific subject-matter content other than that included in the original focusing statement. As one might have already noticed, the focusing statement above could be used in any number of social studies units across any number of nations or ages, and it could fit many behavioral and biological science courses as well. In specifying learning needs, the focus is on "milking" the unit focus for as many separate need statements as is possible.

The extensive list is then "weeded" in order to idenfity the four to six most important learning needs to be stressed in the unit. These remaining learning needs are then converted into general instructional objectives by rewriting them in the appropriate language for such objectives. Thus, from the list cited above,

"How can lifestyles change?"

becomes rewritten as a general instructional objective,

> "At the end of the unit, students will understand how lifestyles can change."

Following this procedure, all of the general objectives for a unit will identify important learning outcomes and are relevant to one another, since they all are generated from the same central focus. At the same time, these general objectives are usable in different units over a wide variety of content areas.

At this time, the teacher begins to identify what specific subject-matter learnings the students are to acquire. This procedure results in two types of basic information. The first includes guidelines students are to comprehend and learn how to use (e.g., a description of six ways in which lifestyles can change). These guidelines then will become the basis for guiding uniprocesses and megaprocesses within the various levels of the Domain of Cognition. The second type of information includes the specific facts that students are to acquire and are to be able to recall at a later time (e.g., the names of five Indian tribes, the date Jamestown was founded, the title of Alex Haley's best-selling novel).

Since guidelines can be learned at the Transfersion, Incorporation, and Organization Levels of internalization, the planner must decide which level is appropriate and reasonable to expect the student to achieve for the given guideline in the length of time allowed for instruction. An example of a specific objective for this unit would be:

> When given an example of cultural change not previously studied, the student will correctly identify, in written form, the way the lifestyle changed, using the description of six ways in which lifestyles can change, as given in class, as the basis for their answer. (TRANSFERSION: REPLICATION)

This specific objective requires that the final student response to the situation make use of information included in the particular unit. Specific objectives written on the Retention Level stress the identification of content data to be retrieved and revealed in the form in which it was originally given or stored. An example of a specific objective on the Retention Level might be the following:

> When presented with a 30 item multiple-choice test on examples of change occuring in lifestyles throughout American history, the student will mark at least 22 answers correctly as determined by citations, handouts and the text. (RETENTION: RECOGNITION)

The procedures outlined above are to be repeated until all of the major guidelines and facts for the unit are incorporated into appropriately written specific objectives.

Specifications for Writing Specific Instructional Objectives

Within the instructional design system outlined by Stahl (1978), the specifications for writing specific objectives are not the same as those advocated by Mager (1962). As has been done previously in this chapter, rather than compare these two procedures, this section will explain in detail Stahl's approach to the writing of specific objectives.

The four components of each specific instructional objective are:

a. the **condition** or circumstances,
b. the **specific behavior,**
c. the minimum acceptable **performance level** of the behavior, and
d. the **criterion** used as a standard against which to determine correctness

Each component is a distinct and important component in its own right. The construction of each component requires the mastery of specific skills directly related to it alone. These components will be described in a somewhat different order than that in which they were identified above for the sake of convenience.

The Specific Behavior

The specific-behavior component identifies the exact activity or product that the student is to demonstrate as an indicator of what has been learned. This component must be stated in terms of observable and measurable behaviors which are **equally noticeable to both** the student and the teacher. This component states exactly what it is that students will be doing or will do in order to show what new behaviors they have learned. A behavior that can be sensually experienced (seen, read, heard, touched, tasted, or smelled) by the teacher must be identified.

Here are two examples of statements which describe what a student must do in order to demonstrate learning:

a. The student will describe Impressionistic Art.
b. The student **will identify in writing** five ways a painting by Monet demonstrates the characteristics of Impressionistic Art.

Statement a indicates only that the student will "describe" Impressionistic Art. But what does this indicate that the student knows? Can do? Is to do? How can the teacher determine whether the student has correctly and/or fully described this area of art? The general behavior "describe" is neither observable nor measurable. More than likely, different individuals will interpret "describe" in very different ways. Hence, when and how will the student or the teacher know when this objective has been reached? On the other hand, statement b leaves no doubts as to what is expected and required of the student. It states exactly what it is students will be doing or will have to do. Note that the behavior specifies "in writing," since merely to "identify" by itself still lends itself to several interpretations as to what **exact behavior** learners will have to show in order to prove they can "identify." Also, to "identify" does not describe a behavior specifically detectable by the sense organs as does "in writing," since what the student writes can be **seen and read.** In conclusion, unless a statement identifies and describes the exact behavior or product which can be seen, read, heard, touched, tasted, or smelled, it is not exact or specific enough.

To master this component, it is suggested that each statement of this component include a **demonstrative verb phrase** which identifies the observable behavior that is expected as a learning outcome. This verb phrase specifies the exact behavior or product that an observer can witness and measure. The following action verbs are commonly cited as being suitable for stating specific objectives, but must be used with caution:

relates
specifies
distinguishes
describes
formulates
predicts
explains
identifies

The reader is cautioned **not** to use such action verbs in specific objectives. While these verbs generally describe certain behaviors they do not specify exactly what students are to do. For instance, how are students to show that they can formulate, specify, or distinguish? However, these action verbs may be used to develop demonstrative verb phrases which are very specific in the behaviors they identify. The following examples show how the teacher may modify action verbs in order to specify exact learning outcomes:

The student **will describe orally...**

The student **will explain in writing...**

The student **will identify by labeling** in writing...

The student **will, in written form, identify** the relationship between...

The student **will write** a synonym for the term "conflict"...

The student **will select and circle** the correct answer from among those given...

The student **will match and then mark** an event with its appropriate date of occurrence...

These types of demonstrative verb phrases specify more exactly the behaviors to be shown than do the action verbs provided earlier, which identify only general behaviors. The above examples provide only a sample of the type of language which must be used in specifying the behaviors required in this component of a specific objective.

The Performance Level

The performance level identifies the exact level of competency which the students' behaviors are required to display in order for them to be judged as providing acceptable evidence of learning. This component identifies the acceptable minimum standard of achievement for the particular content or behavior stated in the objective. The performance level states the degree of completeness, accuracy, or correctness which will be the lowest acceptable indicator that sufficient learning has taken place. For example, examine the following objective:

> "Given ten recipes which they have not seen before, five of which are of Spanish and five of Mexican origin, the students will correctly identify in writing which of those recipes are of Spanish and which are of Mexican origin..."

Does this statement identify a minimum level of performance? While it states a behavioral expectancy, it does not identify how many recipes the students must get correct in order for them to demonstrate a minimum acceptable level of learning for this objective. To fit the requirements for this component, the objective must state how many or what percentage of the recipes the students are to correctly identify. While one could assume that the required level of performance is all ten recipes, or 100% correct, this assumption does not allow the teacher to drop this performance-level indicator from the objective. Hence, a correctly-stated component would be similar to one of the following examples:

> ...the student will correctly identity in writing with 100% accuracy the five Spanish and five Mexican recipes...
>
> or
>
> ...the student will correctly identify in writing all five Spanish and all five Mexican recipes...

As suggested, to merely say that students will "correctly identify" does not say enough about the exact performance level expected. What does "correctly identify" mean? When one states "with 100% accuracy" or "all five Spanish and all five Mexican recipes," there is no doubt as to what is expected and what will be accepted.

In other specific objectives, the performance level may be identified by stating the minimum number of behaviors which are expected. For example:

> ...the students will correctly label 11 of the 13 colonies...
>
> ...the students will state in writing three ways in which Greek and Roman Art were similar to and two ways in which they were different from each other...
>
> ...the students will circle correct answers to 18 of the 25 multiple choice items...

As can be seen, these examples identify the minimum standard of achievement which is to be demonstrated by students at the end of the unit.

The Condition

The "condition" component identifies the exact circumstances, givens, or stimulus which will be imposed on or presented to students when (and while) the specific behavior specified by the objective is to be demonstrated. This component states under what conditions or circumstances the students will have to work at the time the behavior is to be demonstrated. Thus, it may state what time, materials, or other limits are to be given or imposed on the student. It may include what tool(s) and/or material(s) are to be provided, excluded, or are needed by students for them to demonstrate their level of learning. The "conditions," like the "specific behaviors" and the "performance level," must be specified in exact terms, so that the precise circumstances or givens which are to be presented to students during testing are identified prior to the start of the unit.

The examples which follow illustrate the forms that the **conditions** component most often take:

> Given a list of...
>
> When asked to do so on an in-class written assignment...
>
> When given problems on the board...
>
> Given two poems of the Romantic Era...
>
> When called upon to do so...
>
> Given two paintings by Dali which they have not seen...
>
> Given a series of matching test items on the Middle Ages...
>
> When presented with a design problem...
>
> When given a problem which requires the use of the principles of management...

Statements of conditions emphasize what the learner will be provided or what circumstances will prevail while the learned behavior is being demonstrated.

None of these components of the objective automatically suggest a higher level of thinking or learning. Nor do they automatically tie in with one single level of taxonomic behavior. As with the other components of a specific objective, this component interrelates with the others to produce a single statement which does indicate a specific level of thinking, learning, and behavior.

The Criterion

The "criterion" component identifies the exact information which students are to use as the basis or guideline for the behaviors they are to demonstrate. It is well known that students may often be able to answer questions or complete assignments correctly by using information and procedures which are not included in the unit they are studying. As they do so, students may be given credit for achieving the mastery of objectives which they have not mastered as a result of studying the present unit; this occurs because of the correctness of the final answer. For instance, students may be able to interpret a poem at the end of a unit by using previously-learned rules relevant to poetry interpretation. Yet teachers should expect students who studied a poetry-interpretation unit to interpret the poem in ways that those who had not studied the unit would not be expected to use. Hence, the teacher would expect and should insist that students explain, defend, or base their interpretations upon the information about poetry interpretation which was **studied in class** during that particular unit. To this end, it is the interpretation **together with** the basis for this interpretation which demonstrate whether or not real learning has taken place.

According to this approach to planning and evaluation, students should not be given full credit for only their answers, they should only receive full credit for behaviors which **give evidence that students have learned what has been taught in the unit they have completed.** In other words, they should receive credit only for their ability to base their responses upon the information, principles, guidelines, etc. studied during that unit of instruction. Subsequently, the accuracy and correctness of the students' responses and behaviors must be based upon the use of those learning outcomes stressed in their unit and its lessons. This requirement is offered in contrast to the practice of assessing students' responses and behaviors only in terms of their immediate correctness, regardless of the how or why of the responses.

The reasons for this requirement should be clear. If indeed the information, principles, guidelines, etc. are important enough to be taught, they are important enough to be used as the grounds upon which to measure and assess student achievement. Also, the information, principles, and guidelines are in themselves valuable because they may allow students to develop ways of thinking and procedures for dealing and copying with a wide variety of situations and problems. On the other hand, any one single problem or question may be responded to through trial-and-error or guessing behaviors which may have little or no applicability to other, similar problems. Therefore, merely giving full credit for correct answers does not tell the teacher whether students have really acquired the essential information, principles, guidelines, etc., which were stressed in the unit.

To help guarantee that information stressed in the unit is used as the basis for the behaviors demonstrated at the end of the unit, the teacher specifies these learnings in the **criterion** component of the specific objective. This statement identifies the grounds, reasons, or information source which is to be used to accurately assess the students' behaviors. In the example below, note the way in which the criterion identifies what it is students are to use in order to demonstrate that their answers are based upon the content studied in the unit:

> Given two dramas by Shakespeare, the students will write an essay which correctly states at least six ways in which these dramas are similar in their development of the major character, **using the guidelines for character development discussed in class** as the basis for their comparisons.

In this example, the criterion component states very specifically what is to be used as the basis for the response, i.e., "the guidelines for character development studied in class." This required behavior ensures that students do not invent characteristics or features as a result of the immediate test problems, but which are largely a product of test anxiety, guesswork, trial and error thinking, etc. To help guarantee that students are indeed using what they are supposed to have learned, the teacher includes in the specific objective the source to be drawn upon in arriving at correct and acceptable behaviors.

Criterion statements are often stated in terms of some of the wording illustrated by the following examples:

> **...according to the procedures** of parallel parking demonstrated in class.
>
> **...based upon the principles of design given in the text and in lecture notes.**
>
> **...using the guidelines** for developing effective team play as **outlined in the movie.**
>
> **...using the rules for solving quadratic equations as stated in the textbok.**
>
> **...based upon the criteria** for effective paragraph construction as **given in the handout.**
>
> **...according to the characteristics** of classical music **identified in class.**
>
> **...using six of the ten elements** of literary criticism **which were stated in class** as the basis for their response.

In these examples, the criterion component clearly identifies what it is that students are to base their responses upon. It also identifies what it is that teachers are to use as a criterion for measuring the degree to which learning has occurred. Importantly, the higher the taxonomic level of the specific behavior, the more the teacher must insist that students use the stated criteria as the basis for guiding and assisting their thinking and behaviors. Furthermore, since the major thrust of higher level learnings is upon principles, guidelines, and rules students are to comprehend, retrieve, and use, the teacher must ensure that the focus of the evaluation of the students' performances at the end of the unit are the very same principles, guidelines, and rules which were studied in the unit.

Putting It All Together

To review, well-written specific objectives include four separate and distinct, yet interrelated, components. In the order in which they are usually written, these components are:

1. **The Condition.** This identifies the specific givens, circumstances, conditions, or stimuli which will be provided or presented to the students prior to, at the start of, and/or during the performance of the specific learned behavior expected at the end of the unit.
2. **The Specific Behavior.** This identifies the precise, exact behavior to be demonstrated by the students and which will be accepted as indicative that students have achieved the appropriate learning level.
3. **The Performance Level.** Often interrelated with the specific-behavior component, this identifies the minimum level of performance or behavior which will be accepted as evidence that the students have achieved a sufficient level of mastery of the material.
4. **The Criterion.** This identifies the basis, grounds, or information source which students are to use in arriving at, supporting, explaining, and/or justifying their behaviors and which teachers are to use as the criterion for determining whether or not students have attained the major information stressed in the unit.[9]

SUMMARY

This chapter has sought to introduce a new orientation for planning, implementing, and assessing instruction. The Stahl Perceptual Information Processing and Operations Model (SPInPrOM) was proposed as a model of how thinking, memory, and the processing of information take place within the individual learner. The Domain of Cognition was introduced as a system for identifying the sequence of thinking and processing likely to result in several different levels of learned behaviors. A rationale for building the taxonomic scheme upon the degree of internalization of rules or guidelines rather than the assumed "higher or lower level" processes was given.

The role of the Domain of Cognition within the instructional design framework developed by Stahl (1978) was illustrated by examples of the several sequential steps making up this system. Included within this framework are procedures for setting up specific insturctional objectives tied to the information stressed during the unit of instruction. Specifications for writing these objectives were presented.

This chapter was intended to be introductory and descriptive. It was designed to introduce readers to a number of new ideas, models and procedures directly related to instructional design. Rather than concentrate upon a comparative analysis of this approach with existing models, it seemed appropriate to provide more details, so that the readers could proceed to make comparisons relevant to their own interests and needs.

Finally, the models and procedures outlined here are "teachable" to undergraduate and graduate students in teacher-education courses. They have been and are being used to design, plan, implement, monitor, and assess instructional units across a wide variety of content areas. As such, they represent a pragmatic approach to converting research findings into practical procedures for improving instruction.

FOOTNOTE

For those who may desire a more specific comparison between the behavioral objectives format proposed by Mager and that introduced here, the following is provided. Both Mager and Stahl include the necessity of stating the **conditions** under which the behavior will be expected to occur. Both Mager and Stahl indicate that a **terminal behavior** needs to be specified in exact behavioral terms, but they differ on how this should be stated. Mager (1962, p. 14) states the need to specify "what the learner (is) doing when he is demonstrating that he has achieved the objective." Examples of acceptable statements for Mager include "identify by name" (p.14), "write a summary of..." (p.21) and "solve for the unknown..." Stahl, on the other hand, would argue that further specification is needed for two of these three Mager examples. That is, "identify **in writing** the name" and **"write** the solutions for the unknown" are behaviors which are observable; whereas merely 'identify' and 'solve' imply behavior but tend to stress internal thinking prerequisite to or concurrent with the student's actual behavior. Stahl's format does what Mager's does, and goes one step beyond to specify an actual behavior in each and every case. Both Mager and Stahl advocate the need to specify at least a minimal level of successful performance of the behavior specified. For example, "correctly solving at least 30 of 35 linear equations" would be appropriate for both models, with Mager referring to this component as the **criterion** while Stahl names it the **performance level**. The critical difference therefore is in the fourth component added by Stahl which is nowhere to be found in the Mager approach. Stahl's fourth component, which he labels as the "criterial" or **criterion** component, identifies the standard or source of information which is to used (a) by the student to guide his/her behavioral response and (b) to ensure that this response was guided by learning developed as an integral part of the course/instruction. Hence, a statement like "using the guidelines for interpreting Romantic poetry as given in the text" as the basis for the behavior response is required in the Stahl approach and not mentioned by Mager. The advantages of the 'criterial' component lies not only in specifying the criterion for assessing the actual behaviors of the students but also in that it identifies the important content and learning teachers must stress in their courses in order to insure students can recall and use these to base their responses at the end of the teaching.

NOTES

1. Appreciation is extended to the following individuals who have provided their professional expertise and critiques to the various stages of the written drafts of the models presented herein: Drs. John Bell, Robert Armstrong, Susanne Shafer, William Svoboda, and Nicholas Appleton, and Ms. Blanche S. Hunt and Pam Hronek, all from the Department of Secondary Education, Arizona State University, and Ms. Nancy N. Smith, Ravenscroft Lower School, Raleigh, North Carolina.
2. Lengthy descriptions of the Domain of Cognition described herein are available from the author.
3. The debate as to whether this information is ever "dropped" completely from the system is a moot one. Information which is impossible to retrieve, unless under hypnosis or the like, for all practical purposes is "lost" from the system as far as the teacher is concerned (and probably the learner as well).
4. As presented here, there exist no automatically or inherently higher or lower-level processes such as comparing, and analyzing, etc. In this model, all operations of the Perceptual Information Processing System reveal the processing of information. Uniprocesses are ways in which the individual can work with information in a single, unique way. Uniprocesses include associating, classifying, extracting, and valuating. Megaprocesses are combinations of uniprocesses and include problem solving and inductive reasoning. In this system, it is the level of the source of the information which guides thinking and these uniprocesses and megaprocesses, not the processes themselves, determine whether the thinking is a higher or lower level operation.
5. The Retention Level is equivalent to Bloom's "Knowledge" level. Note that this level in the Domain of Cognition is preceded by three earlier levels which affect learning, retention, and ultimately higher-level thinking. In contrast to Bloom's model, higher levels of thinking-learning will not be tied to any given uniprocess.
6. The reader cannot "learn" the information presented in this or any other paper containing new information at the time it is first read or studied. However, what you can recall and/or use about this paper tomorrow could be used to indicate the minimal level of your learning today.
7. Your use of information presented in this chapter today would represent lower-level thinking (TRANSFORMATION), while similar thinking tomorrow, based upon retrieved-via-

Long-Term-Memory details would be an example of higher-level, or Transfersion, thinking.

8. Copies of the curriculum planning approach, in Xerox form, are available from the author at cost.
9. For those who may desire a more specific comparison between the behavioral objectives format proposed by Mager and that introduced here, the following is provided. Both Mager and Stahl include the necessity of stating the *conditions* under which the behavior will be expected to occur. Both Mager and Stahl indicate that a *terminal behavior* needs to be specified in exact behavioral terms, but they differ on how this behavior should be stated. Mager (1962, p. 14) states there is need to specify "what the learner (is) doing when he is demonstrating that he has achieved the objective." Examples of acceptable statements for Mager include "identify by name" (p. 14), "write a summary of ..." (p. 21) and "solve for the unknown ..." Stahl, on the other hand, would argue that further specification is needed for two of these three Mager examples. That is, "identify *in writing* the name" and "*write* the solutions for the unknown" are behaviors which are observable; whereas merely 'identifying' and 'solve' imply behavior but tend to stress internal thinking prerequisite to or concurrent with the student's actual behavior. Stahl's format does what Mager's does, and goes one step beyond, to specify an actual observable behavior in each and every case.

Both Mager and Stahl advocate the need to specify at least a minimal level of successful performance of the behavior specified. For example, "correctly solving at least 30 of 35 linear equations" would be appropriate for both models, with Mager referring to this component as the *criterion* while Stahl names it the *performance level*. The critical difference, therefore, is in the fourth component, added by Stahl, which is nowhere to be found in the Mager approach. Stahl's fourth component, which he labels as the "criterial" or *criterion* component, identifies the standard or source of information which is to be used (a) by the student to guide her/his behavioral response and (b) to ensure that this response was guided by learning developed as an integral part of the course/instruction. Hence a statement like "using the guidelines for interpreting Romantic poetry as given in the text" as the basis for the behavioral response is required in the Stahl approach but is not mentioned by Mager. The advantages of the 'criterial' component lies not only in specifying the criterion for assessing the actual behaviors of the students but also in identifying the important content and learning outcomes that teachers must stress in their courses. Teachers must stress these criteria in order to insure that their students can recall and use these sources for basing their responses upon at the end of the teaching.

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B. DESIGNS

Chapter 14

Programmed Instruction to Computer-Based Instruction: The Evolution of an Instructional Technology

Joseph P. Lamos

Can we, as Pressey originally proposed for programmed instruction, free the learner from the limitation of time and place?

This chapter explores the evolution of programmed instruction from the early Pressey/Skinner days to the present and proposes that present computer technology is capable of answering the above-stated question in the affirmative.

From the early 50s to the beginning 80s, there has been a progressive shift in the theoretical perspectives on the psychology of learning and instruction. This shift has been from the behavioral perspective to the cognitive perspective and has been matched by a corresponding shift in the research and implementation of instructional technology supporting individualized instruction.

In order to avoid the tendency to go all the way back to the venerable examples and techniques of the Greeks (Aristotle in particular), let us agree that the modern foundation of individualized instructional technology derives primarily from the work of two individuals--Sidney L. Pressey and B. F. Skinner. Pressey, of course, provided the teaching machine which clearly represents instructional technology as product. Skinner provided the form of behaviorism which served as the basis for the systematic control of the learning activity, which, in turn, is representative of instructional technology as process.

Though both Pressey and Skinner shared a strong empiricist orientation toward their respective work, their perceptions of the form and use of instructional technology, popularized as Programmed Instruction (PI), was markedly different. Skinner and the PI which followed his orientation provided the necessary foundation for treating the learning process on an individual basis and in a manner which was both prescriptive and specifiable. Pressey, in addition to providing the necessary technological implement, anticipated, as will be shown, the present cognitive perspective and its importance for the instructional technology of the present and the future--the computer.

Programmed Instruction has developed both as product and process, though of late it has generally been thought of in process terms.[1] As process, PI refers to the systematic development of instruction beginning with a needs analysis, or assessment, and a task analysis, both leading to the determination of instructional or behavioral objectives. This analysis of required learning performance and the production of objectives is followed by the development of appropriate criterion test items for assessing the specified objectives and their encompassed levels of performance. At this point, the primary goal of the PI process is to focus on required student performance--the desired observable behavior--and the elimination of "nice-to-know" peripheral information.

Subsequent to the analysis/specification stage of the PI process is the production/design stage. This stage involves the selection of appropriate instructional strategies and media to achieve the instructional objectives. The production/design stage also involves the design of PI as product and includes decisions about the sequence, format, and content of the instruction delivered.

The final stage of the PI process is validation or evaluation. This is the empirical "proof-is-in-the-pudding" test of the worthiness of the instruction which has been designed. Perhaps this stage best represents the scientific/systematic demands of the PI process versus those of a philosophical /artistic approach to the development and delivery of instruction. For the PI process, instructional failure resides more in the instructional design than in either the teacher or the learner. The validation activities occur at two levels. At the first level, small group tryouts are conducted to provide formative information as to the adequacy of original design conceptions and to provide direction for revision. At the second level, large group tryouts and field implementation are conducted to provide summative information for determining the final adequacy of the instructional design and the sufficiency of the instructional analysis of stage 1.

The three stages described--analysis, production or design, and validation or evaluation--represent PI as process. Though there are several models for Instructional Systems Development (ISD), as the PI process has become known, each differing somewhat in the number of steps specified, they all are characterized by the three stages of activity just described.[2] These three stages also represent the activities of the basic scientific, empirical approach--hypothesis generation, experimental design, and hypothesis testing. This basic scientific or "systematic" approach has, of course, served scientific rational man quite well. However, the mystique of its use is that, in and of itself, it produces what one might call "instructional truth." This is an illusion, of course, in that the process is self-regulating so as to ensure original purpose. Purpose, however, lies outside of the regulatory mechanisms of the PI or ISD process and is best reflected by the product of that process--the act of instruction and its consequences.

The act of instruction, or how instruction is delivered, reflects perceptions of what the learner is. This perception, in turn, dictates the form of instruction. Skinnerian behaviorism perceives the learner as a reactive organism. For a given stimulus, the learner responds and is rewarded. The original and classic form of PI represented this view by presenting instruction in small "frames" as discrete stimuli. These frames are followed by the opportunity to make a written or constructed response which, in turn, is immediately followed by confirmation of the correctness of the response given. This classic form is reflected in the definition provided by Bullock[3] in *Volume 14, Programmed Instruction*, of Educational Technology Publication's *The Instructional Design Library*:

> Programmed instruction is described as instructional packages having certain key characteristics or features: self-pacing; frequent opportunities for overt responding to problems/questions (items) accompanied by immediate feedback; and a highly structures (programmed) sequence of self instructional units (known as "frames").

Programmed instruction as product became the technology which permitted concepts from behavioral learning theory to be applied. The behavioral laboratory showed that behavior is a consequence of a reinforcing event. Reward a behavior and it is strengthened. Non-reward leads to extinction of the behavior. The behavior laboratory also showed that behavior is shaped through the incremental and cumulative reinforcement of successive approximations to the desired end-behavior. Additionally, if reinforcement was to be successful, it had to be immediate. The group setting of traditional instruction provides an insufficient setting for the development of desired behaviors. Though one could present a desired behavior broken down into small incremental steps or stimuli, the capability to allow responding by all individuals with immediate reinforcement is certainly limited. A different instructional format was needed--one which dealt with behavior on an individual basis. The printed programmed text became the technology of choice for individual, behavioral-based instruction.

Skinner capitalized on the work Pressey did with the teaching machine, but he rejected its original application using multiple-choice type questions.[4] For Skinner, the teaching machine was a necessary instrument if one were to apply behavioral principles in instructional design.

> Human behavior is distinguished by the fact that it is affected by small consequences...We call an effective person "discriminating" ...contingencies of reinforcement are responsible for human discriminative behavior...The number of reinforcements required to build discriminative behavior in the population as a whole is far beyond the capacity of teachers. Too many teachers would be needed, and many contingencies are too subtle to be mediated by even the most skillful. Yet relatively simple machines will suffice.[5]

However, Pressey's teaching machine was inappropriate for programmed instruction because it didn't permit constructed responses and it permitted, through the use of multiple-choice items, erroneous responses. It did, though, provide a mechanism for individual instruction with the potential of unfailingly controlling response contingencies.

For many years, and even to the present, PI both as product and process functioned to shape instruction as the identification of behavioral elements which would be linearly and progressively presented and reinforced. However, very early in the PI movement, differing conceptions of the nature of learning and the appropriate form of PI were put forth.

Pressey devised his teaching machine not as a mechanisn for the presentation of instruction, but rather as a device to engage the learner with the instructional material which had been previously presented. The teaching machine enabled the individual learner to assess her/his understanding of instructional content and, through the mechanism of immediate knowledge of results, to either confirm her/his correctness of understanding, or to correct her/his errors of understanding. For Pressey, learning was not an..."accumulation of responses governed by environmental contingencies"[6] but rather a process which involved instilling meaningful cognitive structure.[7]

Structure of content and the meaning inherent in it was an important consideration for Pressey. One of his major criticisms of Skinnerian-based, frame-oriented PI was that such a breakdown of a subject-matter into sequential elemental bits destroyed the structure which gives meaning to the material. Pressey suggested:

> that the initial presentation might often best be a very well-organized and well-written substantial statement much like a chapter in a good textbook! And the autoinstruction should follow and should be like a series of questions in a very good discussion of such a chapter.[8]

The concern of Pressey was for the interaction that a learner has with instructional content. For this reason, the use of multiple-choice questions rather than simple constructed responses was not something to be avoided. Instead, multiple-choice questions provided the means by which potential misunderstandings could be represented. An error made by the learner provided the mechanism for clarification through differentiation. This, in essence, represents a cybernetic view, which contends that feedback, or knowledge of results, is informative rather than reinforcing, and permits the learner to self-correct inappropriate knowledge or behavior toward the correct standard.

Subsequent research has, in fact, borne out the validity of Pressey's view regarding the form of response and the nature of feedback. This research has been reviewed by Kulhavy.[9] The results generally point to the fact that feedback provides correction of errors and helps the student to integrate new knowledge with prior knowledge; it does this by informing the student of the correctness of her/his response in relation to both specific and general information s/he already has. Perhaps most damaging to the original behavioristic view that feedback served as reinforcement was research which showed that delayed feedback in certain instances was better than immediate feedback. In fact, students spend more time studying feedback if it is delayed rather than if it is provided immediately after difficult material. The feedback serves to both identify errors and to allow their correction. Control of feedback is important, also, because it has been shown that feedback will not have a facilitative effect if the learner does not have to engage the material in order for her/him to receive the feedback. In such cases, easily-available feedback short-circuits the processing of information or instruction.

Feedback as information for correcting errors presumes that learners will make such errors. This conception immediately liberated the form of PI from its initial concern with small steps as a means to ensure correct responding which could be reinforced. The informative nature of feedback also implies that different learner errors should require differential corrective feedback. Provision of such differential feedback leads to nonlinear branching techniques such as in the form of Crowder's Intrinsic Programming.

Several things are important to the consideration of Crowder's Intrinsic Programming and the form of PI that required.[10] First, response-generating questions served a diagnostic purpose, assessing the learner's meaningful comprehension of the presented instructional content. Errors indicated the need for specific remedial information. Rather than proceeding through instruction in a linear fashion, intrinsic programming presented the student with multiple paths, which gave the appearance of randomly ordered "frames." To proceed, the learner had to make a response which then resulted in the next specifiable point in his path. This availability of different paths of instruction redefined the meaning of and the need for individual instruction: from the simple, proper provision of reinforcement to the diagnosis and adminsitration of instruction based upon the unique requirements of the individual and upon her/his individual performance. With intrinsic programming, PI moved toward the handling of the complexity of individual differences, but the technology of programmed texts and of electromechanical "teaching machines" proved to be a limiting factor to the instructional accommodation of such individual differences.

Printed programmed instructional materials have typically offered poor control over access to feedback. With much of the programmed material which was developed, it was not unusual to find learners not using their sliding masks to cover feedback information, but rather peeking at the answer at the end of the text or on the other page before responding. Control of feedback in printed materials came through a variety of gimmicky chemical or punchboard techniques. If intrinsic programming was pursued, any complex application of branching soon would leave the learner in a state of confusion or inconveniently flipping pages back and forth.

Electro-mechanical teaching machines improved the control of feedback and also provided less obtrusive mechanisms for branching from one place in a lesson to another. But not even the most sophisticated of these devices was or is able to carry on a dialogue over time with a learner, or to modify the sequence or level of instruction, not simply on the basis of a single, immediate response, but on the basis of a history of responses.

COGNITIVE PSYCHOLOGY, INSTRUCTION, AND THE COMPUTER

As we have seen, programmed instruction developed first as product, the programmed text and the linear-sequenced teaching machine; it was developed in order to provide a mechanism by which principles of Skinnerian behaviorism could be applied to the learning process and to instruction. The activity of creating these products evolved into programmed instruction as process, to determine appropriate instructional stimulus conditions and their corresponding response requirements and to verify that the expected learning behavior was in fact being achieved. Individualization was a function of this technology because only at the level of the individual could reinforcement be properly administered. However, the teaching machine, which became intimately associated with the concept of programmed instruction, was originated by its inventor, Pressey, not as a device to accommodate the presentation of stimulus materials and reinforcement schedules, but as a device to accommodate individual differences. The Pressey teaching machine was a self-assessment device for helping students individually process instructional information, no matter how received. As we will soon see, the consideration of individual differences, and their accommodation by the instructional process, raises measurably the level of complexity which must be dealt with. The instructional technology required, both in terms of product and process, must be commensurate in its ability to handle the required complexity.

The concept of individual differences has had a long tradition in psychology, especially in the area of mental measurement and IQ testing. However, in instruction, the planned design of treatments to accommodate specific individual differences has had a more recent history, associated with research in the area of study known as Aptitude-Treatment-Interactions or ATI's. This work, most noteably associated with Lee J. Cronbach and Richard E. Snow, "has been aimed at discovering the differential effects that differing instructional treatments may have on students who vary on some measure of aptitude."[11] Thus, for example, "high verbal" students would be expected to do well with more visual and/or auditory materials, such as sound/slide presentations.

The original and continuing goal of many ATI research efforts is to establish a body of data which would permit a predictive classification system; this system would enable instructional designers to specify a particular and maximally beneficial form of instruction for a learner with particular aptitude levels. This goal, if developed to its fullest extent, has significant implications for instructional technology both as process and as product. It also raises the issue of whether or not the terminology and the existing concepts of programmed instruction are sufficient to encompass and deal with the nature of the instructional design requirements engendered by the consideration of individual differences within the framework of ATI research.

Consideration of newer instructional technologies should attend to the point that there has always been a unique interplay between science and technology. Isaac Asimov addressed this point in an article in the Saturday Review, wherein he took exception to elitist distinctions made between "pure" science and "applied" science and technology.[12] In this same article, Asimov points out that "The fact is that science and technology are one,"[12] and that the history of scientific successes is a history of its tools as well as of its ideas. New technology provides new avenues for scientific speculation and discovery. The psychology of learning, a "pure" science, and the psychology of instruction, an "applied" science, also interplay around the technology used. The advent of new technology presents new opportunities for both scientific and practical activities. In this context, the technology of programmed instruction has necessarily evolved to a level of technology which is more capable than in the past of dealing with the evolving complexities inherent in present conceptions of human learning activity. This new level of technology is most highly developed in Computer-Aided Instruction (CAI).

As mentioned earlier, the ATI approach to individual differences raises the level of complexity of instruction. In terms of the first stage of the original PI process, analysis now requires assessment not only of the task requirements as dictated by the desired performance of the learner, but also increased assessment of individual learner requirements. Wittrock, in an article detailing the impact of cognitive psychology on instruction, touches many of the areas of cognitive functioning which can distinguish individuals.[13] Among these are cognitive style, which is the stable manner in which individuals perceive, code and store information; and cognitive strategies, which are the unique ways in which individuals process--or organize--information or knowledge in memory.

Consideration of each of these areas of cognitive functioning leads to what some authors refer to as cognitive task analysis.[14] This is the determination of instructional content based upon which cognitive processes or operations are necessary in order to perform a given task. Cognitive task analysis differs from traditional behavioral types of task analysis in that the analysis goes beyond the logical decomposition of tasks into their component skills or knowledges. The traditional task analysis, exemplified by the use of a Gagneian-type hierarchy, would break a task such as the addition of integers into rules for addition, into concepts such as 0 as a place holder, and into discriminations such as the identification of whole numbers. What is not made explicit in Gagne's hierarchial conception of task analysis is a model of performance[15]--the specific mental operations which entail the recognition of a whole number or the assessing of propositional knowledge underlying rule utilization.

Efforts at cognitive task analysis generally follow an information processing approach, representing task performance in terms of formal process models.[16] The information-processing approach perceives the human learner as acting upon, or processing, information or data.[17] The data, as it exists in memory, has a structure and is stored and or accessed. Incoming data enters first a short-term, or working, memory store wherein processing activities occur which cause its transfer to permanent memory or long-term storage. Likewise, data in the long-term store has to be retrieved and enter working memory before it can be acted upon. Task performance, in information-processing terms, can be described as a function of the data in working memory, of the cognitive actions which govern new data entering from the external world, of data retrieved from long-term stroage, and of the integration and synthesis performed upon all of these sets of data which result in new memory structures being established. Individual differences translate into the differential processes which govern the availablity of data to the working memory from both the external (instructional context) and the internal (mind) environment, and the differential processes governing the integration and synthesis of that data.

COPING WITH COMPLEXITY

The computer has served as a metaphor for the information-processing conception of cognitive psychology. Likewise, it is the computer which provides a reasonable technology for dealing with the instructional complexity which results from these conceptions. As we begin to understand how people differ in cognitive structure, strategies, and styles which they bring to an instructional setting, the old adage "to begin where a student is" becomes more meaningful and important. But why is dealing with individual differences on such a detailed level more important now than it was in the past? It really is not an issue of being more important now, for perceptive educators have always been concerned with individual differences. Rather, the importance comes from the combined result of knowing more about what these individual differences are and the fact that we now have a technology available for dealing with them. Additionally, we no longer have the luxuries, if in fact they were luxuries, of working from a small database of generalized and specialized knowledge for use in solving our problems, or of sufficient time to allow a leisurely approach to the finding of solutions, or of educating only a relatively small number of people skilled in those processes which might reach these solutions.

Every field of human endeavor is now faced with an information explosion. Our society depends more and more upon highly-trained and educated people. Time for carrying out the educational process becomes more limited in the face of what people need to know in order to become competent. Training and education must become more effective, and those responsible for it must pay attention to and deal with individual differences in order to maximize the efficiency of the learning process.

Meaningful approaches for dealing with individual differences will inherently involve complexity. Richard Snow has already pointed out that the early goal of ATI research, to find generalizable relationships between a particular treatment and learning outcomes, has not been fruitful:

> However, as work on aptitude-treatment interaction (ATI) has proceeded, it has become clear that interactions, both among individual difference variables and between them and instructional conditions, can be so complex as to push generalizations beyond our grasp, practically speaking.[18]

Snow continues, stating that ATI research has shown the importance of detailed description of both specific instructional situations and specific groups of people. ATI demonstrates a condition not conducive to the development of broad, generalizable theory (mass solutions to individual differences?) but rather one which necessitates instructional design as a process of formative evaluation in localized environments.

In the past, the complexity inherent in any set of learners was compensated or controlled for by traditional methods which reduced or transformed a set of individual learners to the equivalence of a single learner. This point and others is used by Robinson in contrasting "traditional" with those "modern" (individualized) methods of instruction which are based on cybernetic principles and which function within complex systems.[19] To briefly summarize Robinson's thesis, variety in a complex system (i.e., learner actions) has to be matched by an equivalent compensating, regulatory variety (i.e., teacher actions) if system equilibrium (i.e., control) is to be maintained or achieved. If system variety exceeds regulatory variety, some form of constraint has to be imposed upon the system. One form of constraint is to reduce variety by such means, for example, as ignoring individual differences in a set of learners. The other form of constraint is to reduce variety by absorbing it. It is in this latter form of constraint that technology becomes important. As Robinson states, "One major solution-area that must be seriously considered is the use of 'variety eating' information-processing technology."[19]

The computer in both of its two major instructional applications, computer-managed instruction (CMI) and computer-assisted instruction

(CAI), serves to absorb the variety associated with the learners or amplify the variety associated with the teachers. CMI is the use of the computer in its more normal function of data processing. It provides the mechanism by which individual aptitudes can be assessed, and prescribed instructional alternatives can be assigned in accordance with the assessed aptitudes. CMI also fulfills the need for collecting learner data as part of the formative evaluation process Snow talks about in the determination of useful ATI's. CMI deals with absorbing the variety which exists between learners.

CAI is the use of the computer to instruct a learner "one-on-one." Its key aspects are interaction and the capability for exercising intelligent-appearing judgment. Where CMI deals with inter-learner variability, CAI deals with intra-learner variability. In the same manner that product-forms of programmed instruction preceded the conception of PI as process, CAI--as the product-form of computer-based instruction (CBI)--has generally preceded the more management-and-design, process-orientation of CMI.

As with programmed instruction, much of the nature of the CBI technology can be revealed by looking at its product form. Initial attempts at CAI clearly show its evolutionary basis in PI. These early CAI attempts, and for that matter, much existing CAI, utilize lessons which are characterized by the linear presentation of "frames" of information followed by a response mode. This has lead to the often-heard criticism of "page turning activity" which, it is claimed, does not justify the greater cost of the computer technology in relation to the use of such media as programmed texts or automated sound/slide presentations. The true difference between PI and CBI as instructional technologies lies in CBI's potential ability to deal with the unexpected and the unplanned.

Returning to Robinson's discussion of the cybernetic aspects of classroom control, it is important to emphasize his contention that only variety can control or compensate for variety. In cybernetics, this is known as "The Law of Requisite Variety." In instructional terms, it represents the ability to provide flexible alternative paths of informational access in order to offset differences in cognitive structure, strategies, and styles. Programmed instruction, through self-pacing, offers one level of flexibility through the manipulation of the time variable. However, having more time available may not be sufficient if the specific instructional approach taken has requisites which are not within the cognitive capabilities of the individual.

Branching programmed instruction exemplified by Crowder's intrinsic programming can be anticipated not to be sufficient, either, when the full range of potential cognitive attributes are considered. Though much CAI written in the past and being written today is characterized by a "printed frame" format with brancing between frames, this is probably a transitional state of affairs, existing until the evolution of programmed instruction to computer-based instruction is complete. The full impact of the computer upon programmed instruction will probably lie beyond the planned interaction of today's structured lessons. Instead, it may lie in the use of the computer as a patient partner in dialogues or conversations on an instructional topic. If we are novices, the computer can act more as the mentor, guiding us with leading statements and questions. If we have more experiences and cognitive comprehension of a topic area, the computer can serve as a knowledgeabel colleague, allowing us to explore different avenues of "his" experience.

The conversational approach to instruction via the computer has already been suggested by Pask.[20] Pask has formulated a "conversational theory" for the learning of complex subject-matter. The result of this theoretical position has been the development of computer-based systems which represent the understanding of a subject-matter by both the teacher and the learner. This system, in turn, can be used to instruct the student in the subject-matter. The teacher mode is one of "directing attention to what needs to be done" while the learner mode is one of "assimilating the subject matter."

To simplify greatly Pask's approach, a subject-matter expert articulates a subject-matter as a collection of "TOPICS." A TOPIC represents a set of formal propositional relationships in a particular context. The CONCEPT of a TOPIC is the mental representation (cognitive structure) which satisfies the accepted and formal relationships which the TOPIC consists of. The understanding of a learner is the ability to construct or reconstruct the CONCEPT of a TOPIC. It is possible for the "teacher" and the "learner" to have different CONCEPTS of a TOPIC, but if each CONCEPT leads to an equivalent outcome or satisfies the same relationship, then they are both acceptable or in agreement. The subject-matter becomes a formal network of TOPICS known as an "entailment structure." This entailment structure is externalized via a computer representation and becomes available to both teacher and learner. The understanding of a subject-matter entails a conversation between the teacher and the learner about the TOPICS in the entailment structure, and understanding is exhibited when there is agreement between the teacher and the learner about the CONCEPT of a TOPIC which a learner has expressed.

In Pask's early work, the computer served to model the entailment structure and the conversation was between a live teacher and student. Later Pask suggested that the computer itself take on the teaching function:[21]

> Under these conditions the computer is able to direct the student to appropriate information and demonstrations...The student can carry out tests of his understanding and the computer will check which of the derivations are correct...[22]

As such, the computer models the subject-matter and the learner converses with the computer about that subject-matter. Unlike prestructured "branching" of PI or existing CAI, the exact nature of the conversation for a particular student is unknown beforehand. However, both the computer and the learner interact on the basis of the specific model of the subject-matter. Thus, the variety of computer-response capabilities tends to match the variety of learner inquiries.

Intelligent CAI is a term which recently has come to refer to the more sophisticated level of interaction suggested by Pask's formulations. An example of intelligent CAI is work done by John Seely Brown and his colleagues with SOPHIE (SOPHisticated Instructional Environment).[23] SOPHIE was originally designed to simulate electronic circuitry through computer programs. Thus, SOPHIE would have a model of a particular circuit and "knowledge" of its operation. With this model and a natural language interpreter based upon artificial intelligence research, SOPHIE enabled a student to make inquiries concerning the operation of the circuit based upon stated settings of specific input conditions. In the research Brown did, SOPHIE was used to model an electronic power supply for the purpose of supporting training in troubleshooting procedures. At the beginning of the program, SOPHIE would initialize a fault condition, followed by statements of initial control settings of the device. Following are a few examples of the possible interchange between the computer and the learner:

> Learner: What is the output?
>
> Computer: The output voltage is 1.2 volts.
>
> Learner: Is that right?
>
> Computer: In a working circuit, the output voltage is 30.1 volts. That value is incorrect.
>
> Learner: What is the voltage between the current-limiting transistor...and the constant-current source?
>
> Computer: The voltage at N4 is 2.8 volts.

As you can see, the learner is able to freely "converse" with SOPHIE, moving the instructional interaction beyond the preplanned and limited options of frame-oriented instruction.

When Pask and Brown were doing their initial research, available computer technology necessitated large and complex hardware configurations. However, as the closing years of the seventies have shown, dramatic increases in computer-power, matched by equally dramatic declines in both size and cost, make it entirely feasible in the immediate future for conversation-like instruction to be supported by computer-based instructional technology. It will be through such technology that instructional designers and technologists will be able to begin to apply the knowledge accumulating from the cognitive sciences in order to meet the diverse instructional needs of individual learners. With the evolution of instructional technology from programmed instruction into computer-based instruction, we are coming very near to fully realizing the oroginal purpose Pressey conceived for his teaching machine--to free the learner from the limitations of time and place.

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Chapter 15

Designing an Alternative Teaching Approach (Feedback Lecture) Through the Use of Guided Decision-Making

Dean Osterman

The following chapter explains how the Guided Design method of teaching can be used to solve problems, and how this method was used as an ID technique in the development of a new method of teaching. This method, called the Feedback Lecture, is illustrated through an example, and research data on its effectiveness is presented.

INTRODUCTION

This paper focuses upon two discussions pertinent to redesigning the traditional lecture form of teaching and learning. One description provides the reader with the **process** (Guided Decision-Making Strategy) used by a team of instructors and the author to design and develop the **product** (Feedback Lecture; a newly-created instructional approach developed at Oregon State University). The product, the other description, is discussed as it exists in its present, developmental stage and the research conducted on its effectiveness is presented.

USING GUIDED DECISION-MAKING (THE PROCESS)

Guided Decision-Making, as developed by Charles E. Wales, West Virginia University and Robert A. Stager, University of Windsor, is a teaching/learning approach involving small-group discussion, problem-solving activities related to real-world situations, and increased opportunities for motivating students. Guided Decision-Making is an educational strategy, part system, part attitude. It reshapes the traditional lecture approach by having small groups of students working together on open-ended problems provided by the instructor. It is based upon the conviction that the student who works through an ascending order of well-designed problems and who actively seeks solutions to problems rather than passively assimilating knowledge will emerge not only better educated but far stronger intellectually (Wales and Stager, 1976).

Although Guided Decision-Making is designed to be a method of teaching, its strategy can be adapted for other uses. As an example, Guided Decision-Making has been used as a process for resolving problems confronting departments or administrations. Problems facing instructors are identified, such as large student populations, limited budgets, inconvenient teaching facilities and many other frustrations. Guided Decision-Making can facilitate the improvement of these situations by helping participants to sort out the possibilities from the impossibilities. The strategy aides them in arriving at one or more possible decisions which can be implemented. The individual steps of Guided Decision-Making allow an instructional developer to work with faculty members in reaching necessary solutions. The strategy guides the instructional developer towards the shaping of good, better, and best solutions through the use of a structured format to be used in consultation with faculty members.

The design as indicated in Figure 15-1

demonstrates the flow of Guided Decision-Making. The steps are described in Figure 15-2.

The design and its steps are helpful to groups of instructors attempting to arrive at solutions to specific problems. An example of this strategy is described in a later section entitled Using Guided Decision-Making to Design the Feedback Lecture.

GUIDED DECISION-MAKING AS A TEACHING APPROACH

Dissatisfaction with the traditional lecture method of transmitting knowledge has led to the development of new teaching techniques which place the student in a more active role in the

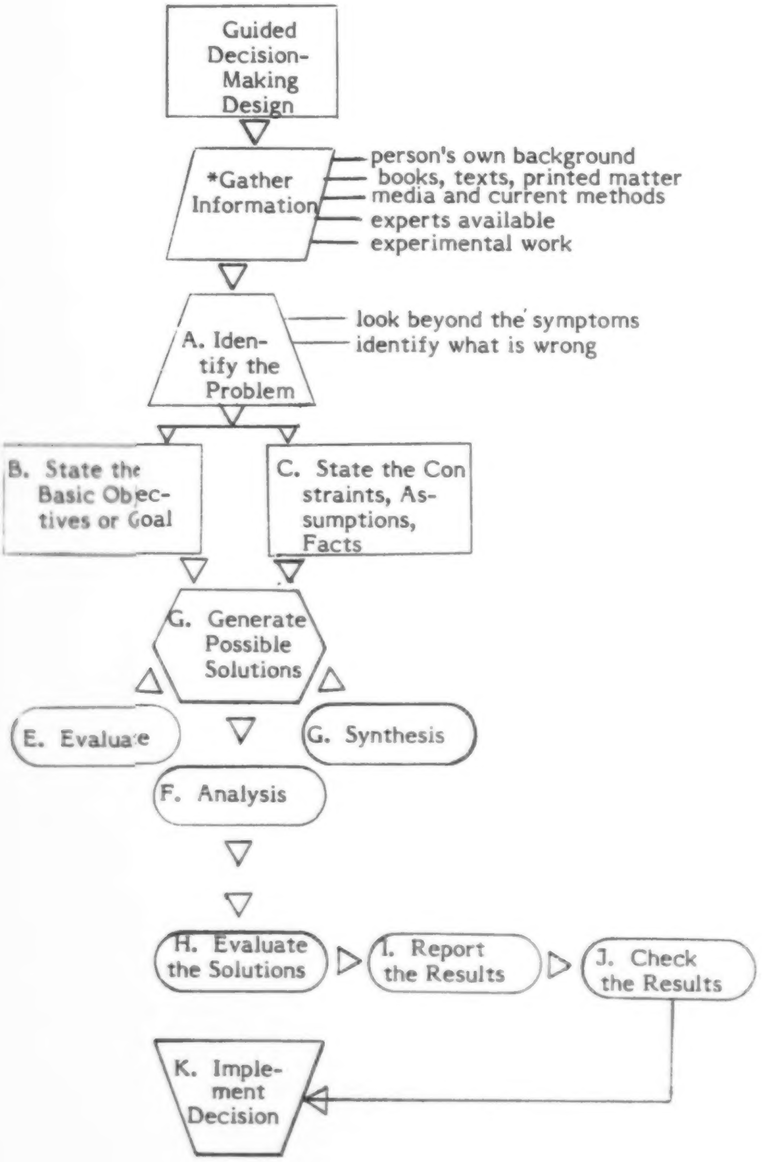
Guided Decision-Making Design
*Gather Information
person's own background
books, texts, printed matter
media and current methods
experts available
experimental work
A. Identify the Problem
look beyond the symptoms
identify what is wrong
B. State the Basic Objectives or Goal
C. State the Constraints, Assumptions, Facts
G. Generate Possible Solutions
E. Evaluate
G. Synthesis
F. Analysis
H. Evaluate the Solutions
I. Report the Results
J. Check the Results
K. Implement Decision

Figure 15-1. Flow chart.

Figure 15-2. Steps in Decision-Making.

-- **Gather Information**

This step is listed because it is usually a component of each step in the decision-making process. It involves a search for pertinent information from the person's own background, books, printed matter, media, other people, experts and experimental work.

A. **Identify the Problem**

Someone may ask you to solve a problem or you may discover it by yourself. In either case you must learn to look beyond the symptoms of the problems to find out what is wrong.

B. **State the Basic Objective or Goal**

The Basic Objective focuses your thoughts on the real problem to be solved; it should be a statement which is broad enough so no reasonable possible solution is eliminated.

C. **State the Constraints, Assumptions and Facts**

Constraints are factors which affect the outcome of the project and cannot be changed. Assumptions are applied to factors which can be changed to simplify the problem and make it solvable. Facts are statements of things that are known.

D. **Generate Possible Solutions**

This is the time for creative thinking. Don't prejudge ideas as they are generated; get all the different thoughts you can.

E. **Evaluate and Make a Decision**

Determine which possible solution is most likely to solve the problem.

F. **Analysis**

Separate the chosen possible solution into meaningful elements. Determine and gather the information you need to develop each element.

G. **Synthesis**

Combine the elements to create a detailed solution.

H. **Evaluate the Solution**

Does it satisfy the basic objectives; is it feasible, practical, economical, safe, legal, and moral?

I. **Report the Results and Make Recommendations**

Prepare a report that describes what you have done and decided. Think about the information needs of the person who will read the report. Don't write what isn't necessary. Do write all that is necessary.

J. **Implement the Decision**

What should be done? Should we select a new basic objective, perform additional decision-making or research work, or begin to implement the recommended solutions?

K. **Check The Results**

Did the solution work? Is further 'design' effort required?

educational process, rather than simply leaving him as a consumer of facts which rapidly become dated. Students need guidance in the complex process of problem-solving, and Guided Decision-Making provides this sort of guidance. To illustrate this sequential problem-solving process, the author has provided an example of a Guided Decision-Making project which traces the work of a group of instructors seeking a new design for the lecture format.

The learning process in Guided Decision-Making revolves around the students' efforts to devise solutions for a series of carefully designed open-ended problems. While there is no single correct answer to any of the problems, each requires students to put into play specific information and skills in order to develop a feasible solution. The instructor selects the problems according to the skills and subject-matter the students should learn and prepares written instructional feedback material which guides them through a "model" solution.

The manner in which students deal with the problems is carefully organized. Each problem is broken down into a sequence of problem-solving steps. Students must deal with each step in a pre-established order and are not permitted to progress to a new step until they have adequately considered and dealt with the preceeding one. Students work in class in groups of from four to seven members, and it is as a group that they formulate their own plan for tackling each step. As intended by the professor in his selection and sequencing of the problem, the group quickly discovers that certain information is needed in order to make appropriate decisions. These needs have been anticipated by the preparation of a library of materials--traditional and programmed texts, reference books, audio-tapes, etc.--which students are expected to consult.

The solution of a given open-ended problem may take only one week of class time or as long as five weeks. During this period of time the students are expected to study and learn the same amount of subject-matter that would normally have been considered in a traditional class. Tests on this material are given in the usual way. However, the students' motivation to learn is improved, because at least part of the subject-matter is required in order to produce an effective solution to the problem chosen by the professor. Thus, this information is always brought back to the group, providing optimum conditions for group problem-solving, with its give-and-take of ideas, insights, and opinions.

When the group has decided upon its action for the decision-making step under consideration, it is given written feedback material, prepared in advance by the professor. The material presents one or more possible decisions the group may have reached by this point, elaborating upon the strengths and weaknesses of each. After the students compare the "pros" and "cons" of their decision with the arguments given by the professor, they are allowed to advance to the next step in the problem.

By focusing upon both decision-making and the acquisition of knowledge, Guided Decision-Making brings knowledge alive as the tool of an active mind seeking orderly solutions to complex problems. The open-ended nature of Guided Decision-Making problems and the stress upon group problem-solving makes this approach a close approximation to "real life" experience, in which few problems are susceptible to a single, black-or-white solution, and in which many different opinions and values must be considered and reconciled in the decision-making process. In summary, under this approach, students not only acquire knowledge within the discipline but also develop their ability to learn on their own, think logically, gather the information they need to make intelligent decisions, make value judgments and communicate their ideas to others. (Wales and Stager, 1976).

USING GUIDED DECISION-MAKING IN INSTRUCTIONAL DEVELOPMENT

Guided Design can be used in the Instructional Development process as a method for dealing with problems inherent in teaching.

Consulting together, a team of instructors together with the author set out to devise solutions for resolving problems involved with the traditional lecture. It was decided to use the Guided Decision-Making Strategy. With no written materials (instructional feedback) prepared in advance, such as would be available in most Guided Decision-Making classroom experiences, the group used the decision-making strategy to arrive at the new teaching approach, The Feedback Lecture.

USING GUIDED DECISION-MAKING TO DESIGN THE FEEDBACK LECTURE

The sample project used as an example below demonstrates a Guided Decision-Making project and shows how it appears when ready for classroom use. Additionally, it serves as a model, recording the steps of a faculty group which set out to improve the lecture by consulting with an instructional developer. For classroom use, students are provided with an "Introduction to the Process of Decision-Making," presented in Figure 15-3.

This model of decision-making, then, was used as the method for arriving at the solution to problems associated with the conventional form of teaching.

WHAT CAN BE DONE TO IMPROVE THE LECTURE?
Guided Decision-Making Project

A. Identify the Problem

Five Oregon State University faculty members plus the author, an instructional developer, assemble to discuss the problems associated with the conventional teaching approach. The lecture

Figure 15-3. An introduction to the process of decision-making.

The material you are about to use is concerned with decision-making--a basic intellectual process which makes it possible for each person to face and solve new problems. This material presents a sample problem designed to introduce you to the basic steps in the decision-making process.

The printed pages in this project are organized in an "Instruction-Feedback" pattern so you can participate in the solution of the problem. Each instruction presents a question which has been raised by a group about one step in the decision-making process. We suggest that each member of your group read each Instruction, discuss it with the group, decide upon a response, and then compare your decision with the printed Feedback which your teacher will provide. This Feedback provides a summary of what your group has probably discussed and represents the decision made by the group. You should realize that the purpose of the printed Feedback is to allow everyone to compare their reasoning with that of other people. No one should feel that they have to accept any of these decisions.

The secretary for each group should record the decisions made by her or his teammates. When the group feels that it has completed its answer to the question asked in the Instruction, ask the instructor to come to the group to check the work or have the secretary take the record to the instructor. If the instructor believes the work is acceptable, the secretary will receive copies of the Feedback and the next Instruction to give to the group. If the work is not yet acceptable, the teacher may ask questions to stimulate further thought.

form of delivery is the main vehicle used by them for instruction. Classes range from 60 to 100 or more students, and instruction is conducted in auditoriums large enough to accommodate the large numbers of students who are required to take the courses. Both majors and non-majors take the courses. The courses are often rotated among the instructors. Students rate the courses extremely low. Teachers instructing subsequent courses report that retention is very small. The other identifiable problems are students missing lectures, poor rest results, too much content covered, poor course-continuity from instructor to instructor, double coverage of material, boredom on the part of majors, overwhelmed non-majors, and general lack of enthusiasm, direction and self-fulfillment.

After the group (consisting of Geoff, Lize, Susie, Ella, Margy, and Dean) discussed the symptoms, they decided to pin down the problem. If you were a part of this group, what would you identify as the problem?

Feedback A. Ella remarked that there is too much content for the course; "We have thirteen objectives for one lecture alone; how can we cut down on the content for the course?" Susie remarked, "Why don't we divide the courses into two; one for majors and one for non-majors?" After further discussions the group felt that these again were symptoms of the underlying problems. The real problem facing the students and instructors is the **teaching method.** It lacks student involvement, specific objectives, immediate feedback to students, intellectual stimulation, and any sort of self-actualization--i.e., making use of students' talents, capacities, potentialities, and energy. The instructional developer, Dean, thought that it would be useful to gather further information concerning the problem prior to concluding the discussion.

B. Gather Information

Geoff suggested that it might be useful to gather information regarding any pertinent data the students taking the courses might be able to offer, as well as comments from past course evaluations and from other people involved with the course. Susie suggested that perhaps first, "It might be best to generate a list of questions to help review what we need to look for in available data; then we would have a better picture of what further symptoms exist; this might suggest alternative teaching forms to study."

If you were part of this group, **what questions would you ask to get the information you need?**

Feedback B. Margy cautioned, "I don't think we should jump to quick responses like we did earlier when we were identifying the problem. Liza, you haven't spoken yet, what do you think should be asked?"

Liza presented the following list of questions:

1. What was wrong with the old approach; why don't teachers and students like it?
2. What suggestions have been offered to improve the lecture format?
3. Why can't other alternative approaches be used? What does the information from student evaluations or peer observations indicate?

Dean added a few more questions to the list:

4. How much student involvement has there been in the past?
5. Does the present teaching-learning approach guide the students' learning?
6. Does the present form of instruction provide for practice in terms

of applying subject content to real situations?

7. What are the objectives of the course? Are they realistic and/or related to best teaching methods?
8. Is students' work evaluated often and are they given feedback?
9. Are students motivated?

Susie said, "Let's start now to find the answers to these questions."

C. State the Goal of the Work

The group studied the list of questions and determined the answers by reviewing the needs-assessment responses and from other available data from students and teachers of the courses. Susie prodded the group along by briefly summarizing the answers to the list of questions. "Why don't I answer these questions orally with the information we gathered?" She provided the following summary:

1. "The students didn't like the old approach because it was inflexible, no questions could be asked, it covered too much material, and no one seemed to know what to expect.
2. The most useful suggestions to improve the course centered around the subject-matter, delivery methods, and course organization. Students were either bored or overwhelmed; perhaps the course could be reconstructed.
3. Other alternatives such as Personalized Systems of Instruction (PSI), Audio-Tutorial, and Guided Decision-Making could not be used due to the large enrollment, limited facilities, and the absence of proctor or tutor assistance. However, it would be possible to use components of each of these alternatives.
4. Student involvement in the past form of teaching and learning has been limited to notetaking, two papers, a mid-term, and final. The role of the student has been passive; the expectation has been for students to memorize content.
5. Students are expected to provide their own direction.
6. No provisions for practice have been offered.
7. The objectives of the course are loose and difficult to measure. Perhaps there are too many. The learner is expected to know what is presented.
8. Students' work is not evaluated often and little feedback, other than a final grade, is provided.
9. Students report that they have little motivation."

"Before we go further," said the instructional developer, "we should put this information together and decide what we expect to do." Ella responded, "Okay, let's decide what the goal(s) of work would be." **What goal or goals would you expect to accomplish through this group work?**

Feedback C. The group decided that their objective would be to select or develop a new teaching approach. "There may be an appropriate teaching/learning format already in use," posited Margy. Susie felt that the expertise of the group would help to determine if any form of teaching other than lecturing would work in their environments.

D. Generate Possible Solutions

Susie began by stating, "Let's find the approach; how about computer-assisted instruction?"

"Wait a minute!" cautioned Ella. "Why don't we look at several teaching methods before we go on; tell me about all the methods that might be available."

Generate a list of all possible teaching methods that might handle the symptoms of the courses.

Feedback D. Susie was quick to respond with a list, and Geoff, Dean, and Margy each listed a few. Some of the suggestions were serious, some were not. Their list consisted of the following:

Guided design
PSI (individualized Instruction)
Lecture-Discussion
Simulations and Games
Mountain Retreats
Computer Assisted Instruction
Classroom Television
Musical Classroom
Learning Packages
Case Studies
Role Playing
Open Classrooms
Drop out of school

E. Specify the Constraints

The instructional developer offered a suggestion at this point: "Would it be possible to examine these approaches, note the limitations of each approach, and also list the constraints faced by us in teaching our courses. Margy thought that the plan might be useful to follow.

Geoff objected. He said, "Dean, your priority should be turned around; how about starting with the constraints faced by the instructors and students exposed to our course?" "Yes, let's do that!" Susie quickly responded.

What constraints would you list that might be critical before adopting an alternative form of teaching or creating a new or modified teaching approach?

Feedback E. Ella responded that perhaps the cost alone of adopting an alternative approach could keep one from using a few of these alternatives. "Hey, guys," Susie said, "I've got my list of constraints; here they are."

1. The **cost-effectiveness** of the teaching approach; that is, is there a savings to the university in terms of expenses involved?

2. The **feedback to students** in guiding their learning; is it immediate or delayed?
3. What **intellectual level** is the alternative capable of handling--simple recall (comprehension), application, analysis, evaluation, or synthesis?
4. **Peer and supervisor approval**--will the department approve of the "new" teaching idea?
5. **Time** to prepare materials and revise as necessary.
6. **Room size** necessary, and limits on class enrollment.
7. **Media** necessary to teach students.
8. Amount of **student assistance** and help available.

The instructional developer added that, "I am impressed with your list; are there other constraints that can be added?"

Ella added a few more:

9. Will the teaching approach **guide** the students' learning?
10. Will it provide for **practice**, both in and out of class?
11. Will **evaluation** be frequent?
12. Will students be **motivated** by the teaching approach?
13. Will **individual needs and opportunities** be taken into consideration?

Geoff asked, "What do we do now?"

F. Analysis

The group thought that it would be difficult to go on listing further constraints, and accepted the list. The instructional developer asked, "Would it be possible to look at the advantages of each approach and list these? Then, we could apply our list of constraints to each approach and rule out some of the methods." The group decided to consider the following teaching approaches from their list:

A. Individualized Instruction (PSI)
B. Small-group discussion (Guided Design)
C. Lecture-discussion
D. Computer-assisted Instruction
E. Instructional Television
F. Simulation and Games

Margy suggested "That maybe we should list the advantages and disadvantages of each teaching approach."

Feedback F.

A. Individualized Instruction

Advantages

1. Students can work at their own pace.
2. Individual's needs are taken into account.
3. Students can receive individual aid from tutors or from the instructor.
4. Students can master the materials.
5. Study guides break units into small learning segments.
6. Evaluation and Feedback are immediate.

Disadvantages

1. Instructors must be prepared to handle students' procrastination.
2. An efficient system of bookkeeping is necessary.
3. Tutors are necessary to help grade students. (If not available, this causes problems.)
4. Most teaching occurs on the knowledge and comprehension levels, and the usual method of learning is to memorize.

B. Small-group discussions

Advantages

1. Decision-making strategy (Guided Decision-Making) can be taught and students can be guided through content material.
2. Students learn to use other students as resources for gathering knowledge and information.
3. Analysis, Synthesis, and Evaluation intellectual levels can be taught and reached.
4. The instructor can take on a new role as facilitator and becomes a viable resource to groups.
5. Feedback is immediate.
6. Students are applying subject content to real problems.

Disadvantages

1. Small-group discussion is limited to small classes of twenty to thirty-five students.
2. The groups may have internal personality problems and a few individuals may not work.
3. Grading group work may be difficult.
4. The students pass or fail as a group, with no differences in grade allowed for individual effort.

C. Lecture--discussion

Advantages

1. A large group of people may be taught by one instructor.
2. The lecture is the most widely used and accepted delivery method.
3. The element of flexibility is always apparent.
4. Lecture notes may be used term after term.

Disadvantages

1. Students follow at a rate established by the experience and pace of the instructor.
2. Students receive no direct-practice experience, motivation, or individual help.

3. Students experience a lack of involvement or stimulating mental activity.
4. Students may not feel comfortable raising questions of requesting further discussion on specific points.
5. Faculty members may not be prepared to lecture or may lack preparation and appropriate delivery skills.

D. Computer-Assisted Instruction

Advantages

1. Students are not embarrassed when errors are made, as there are no human monitors.
2. Students receive practice and rapid feedback, and become motivated by success.
3. Units are broken into small segments, often using a programmed instructional format.
4. A wide variety of programs may be available, teaming efforts of instructors from several universities.
5. Learning is self-paced and individualized.

Disadvantages

1. Students are not necessarily guided in applying subject content, but are often directed to memorize without learning how to use the subject content.
2. Initially, computers are expensive and not cost-effective.
3. Students often have a fear of computers.
4. It may be very difficult to generate specific instructional programs or locate commercially-made units.
5. Computers are subject to "Murphy's Law."

E. Instructional Television

Advantages

1. Video-tapes may be used to provide practice, give feedback, motivate, and individualize.
2. Video-tapes may be used as an appropriate substitute for the instructor as necessary.
3. Small objects used in demonstrations can be magnified with a close-up lens for increased visibility.
4. Instructors may improve classroom performance by viewing video replays.
5. Several teaching activities can be stored and used for future viewings.

Disadvantages

1. Television equipment requires maintenance and is subject to breakdown.
2. The expense of using this teaching method is high.
3. Instructors may face "attitude" problems on the part of colleagues, superiors, students, or the public.
4. Television users face a compatibility problem with non-standard equipment.

F. Simulations and Games

Advantages

1. This form of learning provides practice, quick evaluation, motivation, and individual work for students.
2. Students may enjoy this activity, and they tend to feel that there may be carry-over to the real world of work.
3. Theoretical concepts can be demonstrated.
4. Games are a form of play, and may be viewed as fun experiences.
5. Group projects may deliver new facts, creations, or goods which can contribute to greater understandings.

Disadvantages

1. Groups may choose not to work together.
2. Students are not necessarily guided through projects.
3. Students may not like to perform their game assignments.
4. Individuals are given group grades and are not rewarded for individual effort.

G. Evaluate and Make a Decision

Susie was quick to point out that "The defects in each approach are kind of obvious, aren't they? What we need is to use the best of each approach and maybe create a new method. Is that possible, Dean?"

The instructional developer thought that it was. He said: "I'm sure that we can improve upon the lecture method. After all, we already know that the lecture form is not working, according to reports." And he provided the following examples:

> (Postlethwait, 1972)
> Lectures are widely used because we are so familiar with the technique and it is reinforcing to the instructor.
>
> (Gage and Berliner, 1975)
> Retention from lecture is poor...the "forgetting curve." With notes and outlines, students remembered 24% immediately after the lecture; one week later, the same students remem-

bered 17% of the material.

(Bloom, 1968)

Approximately 30% of a listener's thoughts were found to be irrelevant to the lecture topic and 14% were passive. Irrelevant and passive thoughts occur twice as frequently in lectures as discussions.

(Cameron, 1968)

In 21 random samples of time during a semester's lectures, 20% of the students were thinking about sex and only 20% were paying attention to the lecture.

(Keller, 1974)

Lectures work best in disciplines where practitioners agree on the major concepts, principles and skills.

Lectures work best for conveying knowledge or organizing various sources for students, to motivate them.

Research shows there is little difference between tape recorded lectures, written lectures and live lectures.

Efficient technique to get a lot of information out quickly. The instructor can synthesize information and motivate.

(Ebel, 1976)

Tape recorded lectures at the graduate level were as acceptable and as effective as conventional lecture-discussion methods.

Students remembered more from a dynamic lecture than from a static one.

(Ulrich and Pray, 1965)

Students who were both allowed and required to study on their own did as well as those required to attend formal lectures.

(Dubin and Taveggia, 1968)

A review of over 100 studies over a 40 year period showed that 51% of the studies favored the lecture method while 49% favored the discussion method. Similar results were found for seven studies comparing lecture and lecture-discussion, also in 14 studies of lecture vs. supervised independent study. Unfortunately, the dependent variable usually was the final exam which was textbook-oriented. Both groups of students thus had a chance to study the text on their own regardless of method used.

(McKeachie, Blight, 1972; Costin, 1972)

These writers have concluded from their reviews of many studies that the lecture method is suitable when 1) the basic purpose is to disseminate information, 2) the material is not available elsewhere, 3) the material must be organized and presented in a particular way for a specific group, 4) it is necessary to arouse interest in a subject, 5) the material needs to be remembered for only a short time and 6) it is necessary to provide an introduction to an area or directions for learning tasks to be pursued through some other teaching method.

They also argue that lectures are inappropriate when 1) objectives other than acquisition of information are sought, 2) long-term retention is desired, 3) the material is complex, detailed, or abstract, 4) learner participation is essential to the achievement of the objectives, 5) higher cognitive objectives are sought (such as analysis, systhesis, or integration), or 6) the students are average or below average in intelligence or educational experience.

(Gage and Berliner, 1975)

...warn that administrative concerns may well override the educational points made above so we should try to improve the methods as much as possible since it is widespread.

"No wonder that the students react negatively to the present lecture format," Margy remarked. "I can agree with some of the findings, but how about getting back to our goal of developing a new teaching approach. Susie reported the difficulties with other alternatives, but it might be possible to use components of each of these alternatives."

"Okay," agreed the instructional developer, "Why don't we list those advantages from each approach that would best fit the list of constraints from our earlier work?" **Refer to your list of constraints and study the advantages and disadvantages of each approach, then list the components from each approach which could be used to create a new teaching method.**

Feedback G. The group came up with the following components that they liked:

A. Individualized Instruction
  - * Individual needs are taken into account
  - * Students can master the materials
  - * Study guides which break the units into smaller learning segments

B. Small group discussions
  - * The group felt that all of the advantages were valuable.

C. Lecture-discussion
  - * A large group of people may be taught by one instructor.

H. Synthesis

The instructional developer concluded that the group's decision was to retain the lecture with modifications. Those modifications are as follows:

Study Guide

Develop study guides for each lecture. Each guide was to include a pre- and post-test to evaluate students' learning, a procedure section, objectives, lecture notes, and reading assignments. Units would be broken into smaller content-segments allowing for individual needs and subject mastery.

Lecture Format

Break the lecture into two parts with a discussion in between. Students could respond, in groups of two, to a discussion question, thus providing **feedback** to the instructor on how the readings and lecture are being applied to a real-world problem. Students would receive an immediate **feedback** sheet from their instructor for checking their work.

Small-Group Work

The group discussion could be used to guide student work, train students in decision-making, and provide immediate feedback to students applying knowledge from readings and lectures to real-world problems. "Since this approach uses feedback from the students and instructor, let's call this approach the **Feedback Lecture,**" the instructional developer suggested.

The group agreed and Susie asked, "Dean, **can you describe to others how to implement this new approach**?"

I. **Implement the Decision**

How to Implement this Approach (Feedback Lecture)

Each lecture is organized into a specific content area with learning bridges (transitions) between each lecture. The lectures are supplemented with study guides that are used by the students before, during, and after the class. In effect, the lecture becomes the audio-tutorial while the students are guided through the learning sequence. The components of the study guide are very important to the overall concept of the Feedback Lecture and are described below:

1. **Cover Design and Title**
   The cover illustration is an eye-catching theme designed to open the student's mind to a "bird's eye" view of the content to follow. Such designs, usually abstract patterns or drawings, suggest to the students key concepts to be presented during the lecture, and place these concepts into a concrete illustration of subject-matter. The title, unit, lecture number, and page number are placed on the title page for coordination purposes.
2. **Procedures**
   Page two is the procedural page. On this page is a description of the Feedback Lectures and suggested procedures for studying for the lecture. Such suggestions on how to use the pre- and post-test, most effective ways to use the study guide, and inspirational thoughts are provided.
3. **Introduction**
   Page three presents the Introduction to the Unit, presenting a descriptive theme designed to join the cover design and content information together in an overview of what is happening in the unit and/or lecture.
4. **Objectives and Terminology**
   Page four lists the objectives and terminology specifically developed or used in this lecture. The objectives are few in number, and are accomplished during the lecture-and-discussion period, which is 50-60 minutes long. The first twenty minutes consists of conventional lecture. This is followed by an eight-minute discussion period, and a second twenty-minute lecture period. By reducing the number of objectives to cover, the instructor has time to explain each point fully, including its restatement. An immediate revelation comes to those instructors using Feedback Lecture for the first time; too much material was covered before, and at too rapid of a pace. Therefore, the reduction in coverage plus making students more responsible for learning content outside of the classes does two things: (1) the extraneous content areas are reduced or eliminated (jokes, stories, some personal materials are still included), and (2) the instructor has adequate time to cover pertinent information.
5. **Pre-Test**
   The pre-test is located on page five. This device tells the students what they have gained from the readings prerequisite to the lecture. This test is not graded and answers are supplied for them at the bottom of the page. The pre-test tells the students what they have not acquired and serves as a non-threatening test, providing practice and perhaps helping to eliminate test anxiety.
6. **Lecture Outline**
   The lecture outline begins on page six and continues to page seven. The notes provided on page six are covered during the first twenty minutes of lecture, and are discussed between the first and second halves of the lecture. Research has indicated that learners are best at handling fifteen to twenty minutes of absorbing content and activity at a setting, followed by activity designed to reinforce learning. This activity can be flexible, allowing for discussions, laboratory activity or simulations. The notes that are provided are main points, guiding the instructor through the

delivery. It is recommended that the instructor not read through these notes, but use the notes as a guide to illustrate content information.

7. **Discussion Questions**
As previously stated, the discussion question provides an involving and participating stage for students near the end of the first half of the lecture. Students pair up and respond to the questions(s) developed for this particular Feedback Lecture. The students must apply the knowledge that they have gained through the prerequisite readings, the pre-test, the procedural page, and the first half of the lecture. The discussion-question sheet is usually placed on the far left of rows to speed up handling and usage. When the instructor completes the first half of the lecture, the students write their answers to the discussion question. These responses are graded later. Points are determined by the instructor's criteria for an ideal response. Once the students turn in their response, the **discussion-question feedback** is passed out. The feedback reinforces the correct concepts that should have been applied to the discussion question, and it models professional reasoning and application.
(Note to potential adopters of the Feedback Lecture: before the students purchase the study guides, remove the **discussion question** and **discussion question feedback** from the study guide packet. These should be passed out at the appropriate lecture during the break between the first and second part of the lecture.

8. **Second Half of Lecture**
The second half of the lecture continues and can be followed by a second discussion, depending upon the instructor's desires.

9. **Post-Test**
Page ten of the study guide presents a post-test. Students can take this exam in or out of class, again depending upon the instructor's preference. The post-test serves as an immediate feedback to the student as to the concepts, facts, or information learned in the unit.

10. **Warm-Ups**
Page eleven is used for listing tasks students must perform prior to the next lecture. Usually this page is called Warm-Ups. Reading assignments, speakers to hear, video-tapes to view and other media to use are listed. These warm-up activities are to be completed prior to the next Feedback Lecture.

11. **Glossary**
The last page(s) of the study guide may be used for a glossary, a reference page, or for notes from the instructor to the students.

J. **Sample of Study Guide**

Susie asked, "Would it be possible to provide a sample study guide?" "Since we are working on my class in Clothing, Textiles, and Related Arts," Ella suggested, "why don't we construct a study guide for the Economics of Clothing lecture and use it as a sample to show others?"

"If you have your existing lecture notes, we can list the objectives to be covered and follow the 'How Tos' of creating a study guide for feedback lectures," answered Dean.

The group proceeded to construct a study guide using the guidelines as provided.

K. **Check the Results**

Margy said, "Are there any results available; I mean has anyone experimented with this form of teaching to determine if students learn or even like it? Perhaps students would not like it at all!"

Susie added, "Dean, haven't you been developing this teaching method for some time now? Do you have any data results yet?"

"Yes, a study has been done at Oregon State University (Progress Report on Improvement of Instruction by Howard P. Milleville, Extension Food Technologist, Department of Food Science and Technology, February 10, 1978) to determine if the lecture study-notes, pre-and post-tests, and study guides would contribute to student achievement and to positive attitudes toward the lectures. A review of the data indicates that the study guides and ten-minute discussion period positively reinforced learning. And the students' response to the attitude questionnaire regarding the teaching format was positive," Dean replied.

"Are there any reports from recent adopters of the Feedback Lecture, presenting their experience with this form of teaching?" asked Nancy.

"Yes," said Dean, "I can provide you with a case study done by Betty Coffey at Montana State University. She is a recent adopter of the Feedback Lecture; you may be interested in her observations and modifications."

Case Study—Feedback Lecture

The author, Betty Coffey; Instructor, Industrial Engineering/Computer Science Department, Montana State University.

Two introductory computer-science (CS) programming classes at Montana State University (MSU) are offered for non-degree CS students. Many curricula on campus require a computer-science class, and others recommend a CS course as an elective. CS 101 is offered for Engineering and Science students while CS 111 is offered for students having little math background. These two courses are offered every quarter, and the population of these courses has increased considerably from year to year, as the figures given in Table 15-1 show.

Table 15-1. Class enrollments for CS101 and CS111 by year.

	CS101	CS111
1973 - 1974	212	60
1974 - 1975	314	99
1975 - 1976	348	109
1976 - 1977	404	118
1977 - 1978	398	141
1978 - 1979	467	246
1979 - 1980 (autumn and winter only)	276	196

When the author was a high-school teacher, a class of 35 students was considered large because in such a class individual contact with students was fairly restricted. The CS 101 and 111 classes, ranging in size from 80 to 150 students, have made it difficult to establish any individual contact at all with students. The traditional lecture method appeared to be a necessary format for these classes, but it was difficult to be relaxed and to interact with the students. "All those students sitting with pencils poised, waiting to copy every word!" Factual information can be transmitted in this way, but it is difficult to be sure that the students understand the ideas which are presented.

Dissatisfaction with the teaching format was the main reason for the author's participation in an instructional development workshop presented for the MSU faculty. A number of instructional techniques were offered in the workshop, but the feedback lecture described by Dean Osterman seemed to be the best method to incorporate into large lecture classes. Fortunately, at the time of the workshop the author was teaching a summer-school class, and the students were willing to be guinea pigs to test out this new approach. Study-guide units were developed day-by-day for the class. The format for the units was an abbreviated version of the recommended structure. Each unit had an introduction, a list of objectives, a glossary of terminology, and lecture outlines for one or more lectures, as well as discussion questions and feedback. Each unit covered a particular segment of the curriculum. Pre-and post-tests were not included because of the time factor.

In class, after the first part of the lecture was presented, students were given the discussion questions and worked together in pairs. They became active participants in the class, not passive watchers. Students learned from each other which concepts they didn't understand, and could get help from the instructor at this time. This part of the class was the most exciting because the students seemed to come alive and their enthusiasm was felt by the instructor. How can a student not listen more closely to a lecture when they know that soon they'll be answering questions directly related to the material, and sharing their knowledge with another person?

The summer-school class tested the original units and made recommendations concerning what they did or did not like about them. Using these data, the original units were rewritten and additional units were developed.

The new study guides were used for the fall with classes of 150 and 110 students. These classes were the big test. The feedback lecture had been well-accepted by the class of 30 students, but would it work effectively with a larger class? During the Fall Quarter, discussion questions were passed out during the class, students answered the questions, turned in ONLY the answers, and then received the feedback to the questions. The process worked smoothly, but the students had many loose sheets of paper scattered in their notes.

The students were asked to evaluate the study guides and the feedback-lecture method halfway through the Fall Quarter. A re-writing and expansion of the guides was considered, and the author wanted to know if it was worth the time and effort. Also, was there any way to eliminate all the loose paper? The response to the study guides was overwhelmingly positive. The guides were an additional expense for the students, but they definitely felt they were worthwhile, and questioned why other professors didn't use a similar method.

Students liked having the lectures outlined for them. Their comments mentioned that their notes were better organized, that they appreciated knowing what to expect in the next lecture, that they were better able to study for tests, that the many examples in the guide helped in writing the assigned computer programs, that their notes were more ordered, extensive and precise, and that they were able to pay closer attention to the lecture since they did not have to write as much now that the programs and examples were included in the guide.

The study guide included many program examples that, in the past, had been written on the board. This took class time, and often students would be copying from the board instead of listening to the explanation of the program. The examples are also on overheads so that they could be discussed more thoroughly while being projected. As one student mentioned 'copying programs is a drag.'

In addition, they felt that the discussion questions and mid-class break were "A breath of fresh air," allowing the students to wake up and start functioning again. Other student comments concerning the discussion questions were: renews interest; stops boredom; answering the questions produces a feeling of understanding; allows the student to ask a specific question; helps students to get involved; 'I could not listen to anyone that long'; makes lecture shorter; 'gets you thinking about the lecture, and makes me listen more closely.' Very few preferred taking their own notes or listening to a traditional lecture.

Figure 15-4 presents a list of the questions asked at the midpoint of Fall Quarter. A breakdown of the students' response is presented in Table 15-2. (Responses to Question 3 and the additional comments are not included.)

Figure 15-4. Evaluation for CS 101 and 111

The use of the Study Guide and Lecture Outline is new this quarter. I would appreciate an honest response from you in order to determine its worth to you, the student.

Study Guide and Lecture Outline:

1. Is the Guide helpful in understanding the material presented in class?
2. Would you rather take your own notes without the Guide?
3. Can you suggest any revisions or additions in the Study Guide? (Be as specific as you can).

Any additional comments?

Discussion Questions:

4. Are the discussion questions during class helpful in understanding the material presented?
5. Are the discussion questions helpful in studying later?
6. After the break for the discussion questions, are you able to again concentrate on the lecture?
7. Would you prefer a straight lecture without the discussion questions?

Any additional comments?

Table 15-2. Responses to evaluation.

Student Responses - 180 Total

Question #	Response: Yes	No	Indefinite
1	171	2	7
2	7	165	8
3	(written response)		
4	156	13	11
5	139	17	24
6	155	6	19
7	14	158	8

Based upon the responses to this evaluation and upon many consultations with students concerning the questions and the feedback, the author decided to incorporate the discussion questions into the study guides. The questions are now located at the end of each unit, and the feedback is in an appendix at the end of each guide. The questions are used as a learning aid and not for test purposes. The answers are not graded or returned. Students attending class and participating in discussions can earn extra credit-points. The students can earn 500 points; these points are distributed among tests (205), homework assignments (245), and a paper (50). A total of 12 extra credit-points can be earned through participation in the discussions.

The author has no doubt that the Feedback Lecture is in every way superior to the traditional lecture. Both the students and the teacher gain more from a class using this method.

Anyone interested in developing the Feedback Lecture should probably begin small and expand gradually, unless extra time is available for development. Start by incorporating the discussion questions into your class. Then begin writing the lecture outlines for particular units or topics. It may take time to develop the whole series, but this helps to better organize the lectures for classes.

Remember, the guides don't have to be perfect and will probably never be finished. The study guide is an outline which can be general enough to adapt to change and can always be expanded. It is a flexible method for presenting ideas as you are delivering supporting content. The lectures are an outline, not a total picture. The use of discussion questions will be an improvement for the students, will increase active participation in the class and, hopefully, will increase the students' enthusiasm for and knowledge of the course.

In conclusion, the Feedback Lecture utilizing the study guides and discussion questions improves presentation in large lecture classes by:

1) organizing the content of the class;
2) having students become active participants in the class; and
3) providing students with reinforcement and giving them a daily awareness of material instead of just at test time.

L. Evaluate the Results

Susie and Ella, then, followed the guidelines as provided above, and developed study guides for the Feedback Lecture form of teaching and learning for use in their Clothing Textiles and Related Arts course. Others followed the lead of Susie and Ella, and are now currently using this form of teaching. (Final exams in these courses produced higher mean scores than in comparable traditionally-taught courses.) Working with the author, an attitudinal questionnaire was developed for evaluating the **Feedback Lectures.** The form and results are presented in Figure 15-5 and Table 15-3, respectively.

Feedback L. Information, Results. Over a three term study with an average class load of ninety-one students per term, Ella and Susie received higher scores in student evaluations, and positive responses from colleagues and administrators. The results of the evaluation (compiled over three terms and averaged, with data representing a total of two hundred and seventy-three students) were as follows:

COMMENTS

The Feedback Lecture is an attempt to apply learning principles and improved conditions to the learning tasks via the lecture format. Certainly other forms of teaching may produce similar or improved results. But the **Feedback Lecture** provides a compromise between the tradition of lecturing and the use of innovative techniques. The learning components found in the Feedback Lecture are:

1. repetition and reinforcement,
2. increased student involvement and activity,
3. organizational factors which increase the efficiency of memory,
4. motivation through participation in small groups,
5. opportunity to exercise decision-making skills,
6. positive guidance and direction.

By redesigning one lecture into the Feedback Lecture format, the instructor should discover that the experience benefits both the students and the teacher. Once the instructor has acquired this experience from using one Feedback Lecture, additional Feedback Lectures can be added to the course.

Figure 15-5. Evaluation of feedback lectures.

Section One

Please respond to each of the following questions by circling the number that best represents your attitudes regarding Feedback Lectures:

	Always	Often	Seldom	Rarely	Not at all
1. How much did you use the study guides?	4	3	2	1	0
	Extremely Useful	Helpful	Just OK	Distracting	Not at all
2. Did you find that the study guides were useful?	4	3	2	1	0
	Extremely Useful	Helpful	Just OK	Distracting	Not at all
3. Did you find it helpful to have the objectives listed in the study guides?	4	3	2	1	0
	Always	Often	Seldom	Rarely	Not at all
4. Did you answer the pre-test and post-test included in the study guides?	4	3	2	1	0
	Always	Often	Seldom	Rarely	Not at all
5. Did you use the lecture outline in the study guides for studying and/or taking notes during lecture?	4	3	2	1	0
	Extremely Useful	Useful	Just OK	Distracting	Not at all
6. What did you think about the break (pause) in the lecture to allow for discussion with a partner?	4	3	2	1	0

Figure 15-5. Evaluation of feedback lectures. (continued)

		YES	NO	UNDECIDED
7.	Did you like the idea of the discussion with a partner?	2	1	0
8.	Did the printed feedback supply information that contributed to your understanding of the discussion questions?	2	1	0
9.	Did you like the idea of knowing what is expected of you prior to attending the next Feedback Lecture?	2	1	0
10.	Do you think that the Feedback Lecture as a teaching/learning method helped you to understand the subject material?	2	1	0

		Regular Lecture	Feedback Lecture
11.	If you have a choice in the future between a regular course and a course using Feedback Lectures, which would you prefer?	2	1

Section Two

By circling a number rate the quality of the Feedback Lectures in terms of the degree to which they:

		Excellent	Good	Fair	Poor	Not Applicable
12.	Held your attention and interest	4	3	2	1	0
13.	Covered the material at an appropriate intellectual level--neither too complicated not too simple	4	3	2	1	0

Figure 15-5. Evaluation of feedback lectures. (continued)

		Excellent	Good	Fair	Poor	Not Applicable
14.	Clearly presented the relevant subject matter	4	3	2	1	0
15.	Stimulated your curiosity	4	3	2	1	0
16.	Stimulated student discussion outside of class	4	3	2	1	0
17.	Were related to one another and followed a coherent sequence	4	3	2	1	0
18.	Were coordinated with other parts of the course	4	3	2	1	0
19.	Rate the quality of the study guide, audio-tutorial materials used in class, and lectures in Feedback Lecture Format	4	3	2	1	0
20.	In comparison with all other core courses in Home Economics at Oregon State University, how would you rate the Feedback Lecture section in this course?	4	3	2	1	0

Section Three (use the back, if needed)

Comments:

Table 15-3. Results in Percentiles.

N=273

Section One

	Always	Often	Seldom	Rarely	Not at all
1. How much did you use the study guides?	5%	89%	24%	0	2%

	Extremely Useful	Useful	Just OK	Dis-tracting	Not at all
2. Did you find that the study guides were useful?	10%	82%	8%		

	Extremely Helpful	Helpful	Just OK	Dis-tracting	Not at all
3. Did you find it helpful to have the objectives listed in the study guides?	81%	10%	6%		3%

	Always	Often	Seldom	Rarely	Not at all
4. Did you answer the pre-test and post-test included in the study guide?	21%	72%	5%	2%	1%

	Always	Often	Seldom	Rarely	Not at all
5. Did you use the lecture outline in the study guides for studying and/or taking notes during lecture?	89%	7%	2%		2%

	Extremely Useful	Useful	Just OK	Dis-tracting	Not at all
6. What did you think about the break (pause) in the lecture to allow for discussion with a partner?	20%	79%	1%		

	YES	NO	UNDECIDED
7. Did you like the idea of the discussion with a partner?	81%	1%	18%
8. Did the printed feedback supply information that contributed to your understanding of the discussion questions?	79%	2%	19%

Table 15-3. (continued)

		YES	NO	UNDECIDED
9.	Did you like the idea of knowing what is expected of you prior to attending the nest Feedback Lecture?	93%	2%	5%
10.	Do you think that the Feedback Lecture as a teaching/learning method helped you to understand the subject material?	90%	1%	9%

		Feedback Lecture	Regular Lecture
11.	If you have a choice in the future between a regular lecture course and a course using Feedback Lectures, which would you prefer?	88%	12%

Section Two

By circling a number rate the quality of the Feedback Lectures in terms of the degree to which they:

		Excellent	Good	Fair	Poor	Not Applicable
12.	Held your attention and interest	20%	78%	1%		1%
13.	Covered the material at an appropriate intellectual level--neither too complicated nor too simple	71%	17%	10%		2%
14.	Clearly presented the relevant subject matter	74%	20%	3%		3%
15.	Stimulated your curiosity	10%	61%	20%		9%
16.	Stimulated student discussion outside of class	5%	12%	58%		25%
17.	Were related to one another and followed a coherent sequence	73%	20%	4%		3%
18.	Were coordinated with other parts of the course	5%	82%	10%		3%

Table 15-3. (continued)

	Excellent	Good	Fair	Poor	Not Applicable
19. Rate the quality of the study guide, audio-visual materials used in class and lectures in Feedback Lecture Format	7%	91%			2%
20. In comparison with all other core courses in Home Economics at Oregon State University, how would you rate the Feedback Lecture section in this course?	79%	15%			6%

In putting together the content materials for each one-hour lecture session of a Feedback Lecture course, it is advisable to use an outline such as the following:

Unit Outline

Unit #, Lecture #

1. **Topic:** What is the content to be covered in the lecture?
2. **Specific Concepts to be Developed:** What are the main ideas to be developed?
3. **Supportive Illustrations or Graphs:** What can be said through the use of visuals?
4. **Prerequisite Assignments, Readings:** How can students prepare for the lecture?
5. **Procedures:** What suggestions can be made to guide the learning activities?
6. **Theme:** What is the central idea of the lecture?
7. **Objectives (Student Outcomes):** What is expected of students?
8. **Abstract of Information to be Covered:** In a few words, what is the lecture all about?
9. **Pre- and Post-test:**
10. **Content Outline (Notes):**
11. **Discussion Question:**
12. **Discussion Question Feedback:**
13. **Student Assignments & Activities (Feedback Activities):**
14. **Warm-Up Activities:** What extra-credit assignments can be offered?
15. **Glossary, References, Instructor Notes:**

Components of Feedback Lectures

The Feedback Lecture is part lecture, part student involvement. The foundation for this method has been described in the previous pages. The components are as follows:

1. **Organized units** with coordination from beginning to end;
2. **Lectures** that provide uniformity, clarity, and space for adequate content coverage;
3. **Feedback Activity** for the instructor and students to guide the teaching/learning process;
4. **Feedback-Lecture Study Guides** with
   - a. cover design and title,
   - b. procedure page,
   - c. introduction (theme) page,
   - d. objectives and terminology page,
   - e. pre-test page,
   - f. lecture outline (first half) page,
   - g. discussion question,
   - h. discussion-question feedback,
   - i. lecture outline (second half) page,
   - j. warm-up activities page,
   - k. glossary, references, instructor notes page;
5. **Learning Principles.**

CONCLUSION

There are other methods for supplying feedback to the instructor and to the students. The electronic circuit-board providing buttons at each student table or desk, wired to a computer with a response-display for the instructor, is useful for providing and obtaining feedback. Such devices are used in colleges and universities to increase awareness and motivation and to assess knowledge. Students are provided with response buttons which feed back information to students either from tests, from responsive questions, or from other activities wihch can be conducted during the lecture. Flashcards, response wheels, and other paper-coded feedback cards can also be used for providing rapid feedback during the lecture. These devices are useful and can be built into the Feedback Lecture format when appropriate.

APPENDIX I: CREATING THE FEEDBACK-LECTURE STUDY GUIDE

Before beginning work on their own Feedback Lectures, instructors should examine an already-existing study guide for such a course. Such an example has been provided in Appendix II. Then they should begin by following the 14 steps listed in Figure 15-6. First efforts should probably be confined to producing a single lecture with its accompanying study guide. The further development of the course consists simply of duplicating this procedure for each lecture.

Moving Right Along

Now that you have defined a topic and delimited a unit of instruction, you have the beginnings of the Feedback Lecture. Using the information steps 1-14, apply this information to the lecture. You will create a study guide that will be used prior to the lecture, during the lecture, and after the lecture.

Sample Study Guide

The study guide found in Appendix II was produced using steps 1-14 above. These steps and this example are provided for an instructor to follow.

Improving the Lecture

In an effort to improve upon the lecture, redesigning it to eliminate as many disadvantages

Figure 15-6.

Unit #_________ Lecture #_________

1. What is the specific title for this lecture?
   State the topic that you will cover during this one hour of instruction.
2. What specific concepts will be developed during this lecture?
   List these concepts.
3. What supportive illustrations or graphs can best be included as visuals to help the learner follow the content as it is being presented in an oral fashion?
4. What prerequisite assignments and readings will be necessary for the students to read to be prepared for this lecture?
5. What procedures can you suggest which will enable the students to study for this lecture and follow the flow of information presented?
   How can you guide the students?
   What can you suggest for the student to do, in order to best learn the content material?
6. What is the overall theme or the central idea of this particular lecture?
7. What do you expect the students to be able to do as a result of studying and learning from the lecture?
   What are your objectives for the students to achieve?
8. What is the basic information that you will cover during this lecture?
9. Jot out a few questions that can be used as a pre- and post-test for this lecture.
10. Outline the basic lecture that will be covered. This will serve as the notes for the students to follow.
    I.
        A.
        B.
    II.
        A.
        B.
11. What discussion questions would you like students to take time in groups of two to discuss in order to check their comprehension and ways of analyzing the material that has been presented during the lecture?
    List a few discussion questions that can be answered in a 5-8 minute period. These questions should ask students to apply the information that they've learned in such a way that they achieve at a higher cognitive level than simply repeating back information.
    1)
    2)
    3)
12. What study assignments and activities can you list which will serve as feedback activities to both them and you and which will involve the students during the lecture process?
    1)
    2)
    3)
13. List warm-up activities which will help prepare the students for this particular lecture. These warm-up activities need not be readings; they can be films, audio-tapes, or many other forms of learning experiences.
14. What terms can you list in a glossary which will help students listening to the lecture?
    1)
    2)
    3)

as possible, the author examined the constraints and limitations faced by the typical faculty member. In most cases, the professor is more or less fixed in a lecture track. The chairs in the classroom are either permanently attached or cannot be moved around to accommodate small group discussions. The professor lacks the time or skills to develop any alternative form of teaching.

The evaluator who provides peer or supervisory feedback for promotion-and-tenure proposes is unaware of alternative teaching methods and is accustomed to seeing good lecture performances. And the budget is set up to provide only for minimal facilities leaving no funds for equipment, proctors, teaching materials, and other innovative forms of instruction. So, what do you have left to work with? Obviously, the lecture. What can be done to improve it within the framework created by these constraints?

1. increase the involvement and participation of students;
2. cover less content in class, but thoroughly cover main concepts;
3. provide reinforcement to students through repetition and application;
4. test the students and judge audience understanding and reaction during the lecture;
5. provide a framework for students to follow in the form of objectives, make prerequisite knowledge easily available prior to the lecture, Xerox the main notes, insert a discussion, have a lecture theme, give follow-up assignments, provide related student activity both before and after.

How can these things be done within this framework?

The Feedback Lecture was created to handle these needs.

APPENDIX II

THE PHYSICAL FACTORS WHICH INFLUENCE THERMAL COMFORT or WHAT YOUR PARENTS DIDN'T TELL YOU ABOUT WHY YOU SHOULD WEAR A HAT

UNIT I, LECTURE I

Procedure for Section III, The Economic Aspects of Clothing

Study and Lectures for Section III, The Economic Aspects of Clothing, are based upon the concept of "Feedback Lectures." This packet is your study guide and includes objectives for each lecture, the reading and homework assignments, and outlines of the lectures and discussion questions which will be utilized during class. A pre-test and post-test accompanies each unit.

The most effective use of the study guide for each lecture is as follows:

1. Read the objectives.
2. Complete the pre-test.
3. Read the assignment.
4. Write definitions for the terms listed on the objectives page.
5. Check the answers of the pre-test with those provided at the bottom of the page.
6. Review the reading material for those questions which you missed.
7. Bring the study guide to lecture and use the lecture outline for note taking.
8. Use answers provided during the lecture to compare with your written answers to the discussion questions.
9. Complete the post-test.
10. Complete the homework assignment.
11. Repeat the process outlined in steps 1-10 for the next lecture.

Clothing is referred to as the "second skin" that interfaces with your psychological, social, aesthetic and physical environments. Humans can adapt to almost every environmental condition on the planet Earth--and beyond--by using clothing as a protective skin.

In Unit I of Economic Aspects of Clothing, we will be exploring a basic purpose of clothing, which is to assist the physiological functions of the human body to adapt to its immediate environment. Our goal is to expand your knowledge of the ways in which clothing can help to make your life comfortable. In the following three lectures we will talk about:

1. The art of keeping warm or cool--what one's body can do and what we as thinking beings can do.
2. How clothing can provide thermal comfort, safety and protection.
3. How clothing can extend our ability to perform in various climatic conditions or specific activities.

PHYSICAL FACTORS WHICH INFLUENCE THERMAL COMFORT

OBJECTIVES:

1. Identify one internal and one external means by which a person can maintain thermal comfort of the body.
2. Define the four processes by which heat is lost from the body.
3. Describe how body heat is lost by radiation, convection, conduction, and evaporation.
4. Describe the physical changes of the circulatory system to maintain body temperature.
5. Explain the processes of sweating and shivering to maintain thermal comfort.
6. Define and give an example of acclimatization.
7. Define and give an example of accustomization.
8. Identify some of the physiological differences between men, women, and children which affect the clothing required for thermal comfort.
9. List five environmental factors which affect thermal comfort.
10. Given the homework exercise that outlines differing climatic conditions and activity levels, list the considerations in selecting clothing to achieve thermal comfort in these situations.

TERMINOLOGY:
Physiological
Radiation
Conduction
Convection
Evaporation
Kilocalories
Asphyxia
Hypothermia
Acclimatization
Accustomization

Factors Which Influence Physiological Comfort

PRE-TEST:

1. Thermal comfort is created within the human body by:
2. Thermal comfort is maintained by __________ which creates a buffer or barrier between the body and its environment.
3. In cold weather, 50% or more of one's body heat is lost from the head, neck and ears by the process of:
   - A. Conduction
   - B. Convection
   - C. Radiation
   - D. Evaporation
4. A learned response which enables a person to adapt to the environment exemplified by carrying an umbrella on a rainy day is called:
   - A. Acclimatization
   - B. Accustomization
   - C. Following mother's directions
5. The experimental factors which affect thermal comfort are:
   - A. Temperature
   - B. Temperature, humidity
   - C. Temperature, humidity, air movement
   - D. Temperature, humidity, air movement, solar radiation
   - E. Temperature, humidity, air movement, solar radiation, atmospheric pressure

ANSWERS:

1. Body heat is generated by the **metabolizing of food in the tissues and muscles.**
2. **Clothing** acts as an insulator between the body and the environment to maintain the heat that the body has created or to allow this heat to dissipate when the body becomes overheated.
3. C. Radiation
4. B. Accustomization
5. E. Temperature, humidity, air movement, solar radiation, atmospheric pressure.

Physical Factors Which Influence Thermal Comfort

LECTURE OUTLINE:

- I. Thermal comfort (refer to Horn, pp. 196-299)
  - A. Maintain by two means:
    - 1. internal--metabolizing food in tissues and muscles
    - 2. external--insulating the body with clothing
  - B. Body-heat transfer
    - 1. radiation
    - 2. convection
    - 3. conduction
    - 4. evaporation
- II. Human physiological adaption to the environment (refer to Horn, pp. 301-303)
  - A. Circulatory system
  - B. Sweating
  - C. Shivering
  - D. Acclimatization
  - E. Accustomization

(note: the lecture will stop at this point and the discussion will begin; please pair up in groups of two's and answer the question(s) on page 1-8. When completed (or after 8 minutes) turn in your response and collect a discussion-question feedback. The lecture will begin again after the discussion period. The discussion-question feedback is removed from your study guide)

Physical Factors Which Influence Thermal Comfort

LECTURE OUTLINE: (continued)

- III. Individual physiological differences
  - A. Metabolic rate
  - B. Physical condition of the body

C. Sex
D. Age

IV. Influence of environmental factors (refer to Horn, pp. 299-301)
A. Temperature
B. Humidity
C. Air Movement
D. Solar Radiation
E. Atmospheric pressure

V. Need for clothing is determined by:
A. Food intake
B. Physical activity
C. Physical condition of the body
D. Extremes of temperature
E. Duration of exposure to adverse environment

DISCUSSION QUESTIONS:

Your living group has "adopted" two elementary children and you have volunteered to spend a day at the coast acquainting them with the flora and fauna. Saturday noon you and a friend of the opposite sex pack a picnic lunch, and put it in the trunk of the car so that no one can snack en route. The sun is shining, the temperature is 27°C (81°F) in Corvallis and everyone is dressed for thermal comfort on a warm fall day.

You drive for three hours without stopping. As you approach your destination you see a squall line developing over the ocean and when you get out of the car, you feel the cool ocean breeze. You immediately feel chilled and start to shiver.

1. What are the physical reasons that you feel chilled?
2. What processes of body-heat transfer are occurring?

The children are so exhilarated that they run rapidly up and down the sandy beach. They are not shivering.

3. Explain why they do not have the same physical response to the change in weather that you had.

Soon the squall line moves closer, and they, too, begin to feel chilled. Your knowledge of the idiosyncratic coast weather alerted you to bring additional clothing so you provide everyone with a wool sweater and vinyl poncho.

4. Your learned response which enables you to adapt to environmental change is called________________________.

DISCUSSION QUESTION FEEDBACK:

1. How many of the following reasons for feeling chilled did you list?
   a. sudden change in temperature from a warm environment and the protection of the car to a cooler temperature accompanied by chilling winds
   b. cloud cover reducing solar radiation (warmth from the sun)
   c. sedentary activity--sitting in the car for three hours
   d. low energy level due to lack of food intake for a considerable period of time.
2. Heat loss due to convection and radiation.
3. The children are involved in an intense physical activity creating body heat. In general, children have a higher energy level (metabolic rate is faster) than adults. Thus they do not need as many clothes when active.
4. Accustomization

Physical Factors Which Influence Thermal Comfort

POST-TEST:

1. From the following, select the only group which includes one external and one internal means of maintaining thermal comfort.
   A. eating and exercise
   B. turning up the thermostat and wearing long johns
   C. eating nutritious food, adding or subtracting clothing
   D. drinking cold beverages, eating salads and ice cream
2. The backpacker whose feet become wet from rain will lose body heat through:
   A. radiation
   B. convection
   C. conduction
   D. evaporation
3. The body speeds up heat loss as an adaptation to overheating by:
   A. shivering
   B. dilating the blood vessels
   C. sweating
   D. acclimatizing
   E. both B and C
4. An inactive, overweight person is not necessarily better insulated from heat loss in cold temperatures than the "average" person because:
   A. the circulatory system functions at a faster rate
   B. the circulatory system functions at a slower rate
5. If one's circulatory system functions at a slow rate, the skin temperature is:
   A. lower, making the person feel cool
   B. higher, making the person feel warm

ANSWERS:
1. C. eating nutritious food, adding or subtracting clothing
2. C. conduction
3. E. both B and C
4. B. the circulatory system functions at a slower rate
5. A. lower, making the person feel cool

ASSIGNMENT, LECTURE 2:
Horn, Chapter 15, pp. 303-310
Brain Warm-ups (on following page)

BRAIN WARM-UPS
(alias homework exercises to be completed before Lecture 2)

Warm-Up I

It is late February and you are planning a weekend cross-country ski adventure in the Cascades. For the past four years you have lived in Reno, where you were introduced to the sport of Nordic skiing in the Sierra Nevada Mountains. You are eager to share this experience with your new friends in Oregon, who are novice skiers. They have asked you to prepare a list of clothing items that they should pack for the trip.

The environmental conditions in Nevada were as follows:

- Daytime temperatures reached 0 to 7 degrees C. (30 to 40 degrees F.).
- Crystal clear sunny days with afternoon winds of moderate to strong velocity.
- Relative humidity reaches 8% maximum.
- Elevation is approximately 2,360 meters (8,000 ft.).

You have been monitoring the weather reports in the South Santiam for the past week and they are summarized as follows:

- Daytime temperatures range from 0 to 3 degrees C. (30 to 35 degrees F.).
- Overcast days with intermittent sun.
- Relative humidity from 50% to 100% (rain turning to sleet in late afternoon).
- Elevation is approximately 1.475 to 1.770 meters (5,000 to 6,000 ft.)

Your skiing wardrobe while in Nevada included: cotton knit long-johns, cotton corduroy knickers, wool socks and hat, cotton turtleneck, wool V-neck sweater, nylon windbreaker, lined leather mittens and sunglasses with dark lenses. Your friends have decided to make the trip to the Cascades because of your enthusiasm and experience with the sport and your promise of a fun weekend. Considering the apparel used in Nevada, compose a list of clothing that will provide thermal comfort for the Cascades Adventure.

Warm-Up II

The following letter was written to you by a friend who graduated from Oregon State University last spring.

September 15, 1983

Dear _______________,

My dietetics internship at Barnes Hospital, in St. Louis, Missouri, is an exciting challenge in many ways. I was fortunate to find a beautiful yet inexpensive new apartment, though I must walk six blocks to the bus and ride for 20 minutes to the hospital. Sometimes the bus air conditioning does not work, but when I arrive at the hospital, it is climate controlled at 21°C. (70°F). The daytime temperature highs in St. Louis have been between 21°C. (80°F) and 38°C (100°F) and relative humidity ranges from 50% to 95%, so my body must acclimatize to an environment that is distinctly different from Oregon. It is HOT!

One problem I have is selecting the proper clothing for work. We have a choice of wearing a white, polyester uniform or street clothes covered by a cotton laboratory coat with long sleeves. I know you are knowledgeable in this area and could list for me the considerations in selecting clothes to achieve optimal thermal comfort.

Please answer by Wednesday!

No sweat!

(Jane) (Jim)

P.S.
I met a neat member of the opposite sex on the bus yesterday!

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Chapter 16

Developing Textual Materials: What Research Says to the Practitioner

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Most materials used in education and training are printed textual materials. Therefore most of the work of instructional developers is in the area of design and production of print materials. Unfortunately most IDers lack knowledge as to what research tells us about the design of such materials. This chapter reviews the research dealing with print materials and therefore provides information concerning what we do most often.

INTRODUCTION

Learning may be defined operationally as the process of acquiring a new behavior (or knowledge) such that the behavior is retained and demonstrated on a reasonably appropriate level in similar situations across time periods. Learning, then, is an active process of acquisition while a "learned" behavior indicates that a new behavior has in fact been acquired (Stahl, 1979).

To enhance learning as a process towards the acquisition of knowledge, Hittleman (1978) has suggested that the following elements are consequential:

(a) the kind and form of information to be learned,
(b) the manner in which the information is presented,
(c) the maturity of the individual, and
(d) the plans for solving problems devised by the individual learner.

The present chapter will be primarily concerned with Hittleman's first two elements, since it focuses upon information relevant to the development and preparation of text materials intended for instructional use. However, as the chapter progresses, it will become increasingly clear that the last two elements play a critical role in how well individual learners actually comprehend the information as represented in 'a' and 'b' above.

THE WORKING FRAMEWORK: AN OVERVIEW

Generating a definitive list of guidelines from empirical research which has not produced universally practical of generalizable principles created an initial obstacle to the preparation of this chapter, for such a document would at best only profess marginal scholarship. Although originally we had hoped to be able to do so, for reasons related to the results of research investigations it is not possible to report a series of specific guidelines which hold absolutely across all learners. However, we were able to develop a schema which allowed us to treat the subject of text design in a manner compatible with our original objective and within the parameters allowed by the research findings. The schema finally developed is represented in Figure 16-1.

Presumably, the desired result of written text designed for instruction and learning is a product that has a high probability of being comprehended, that is, of being understood by the intended learners. Hence, in our schema,

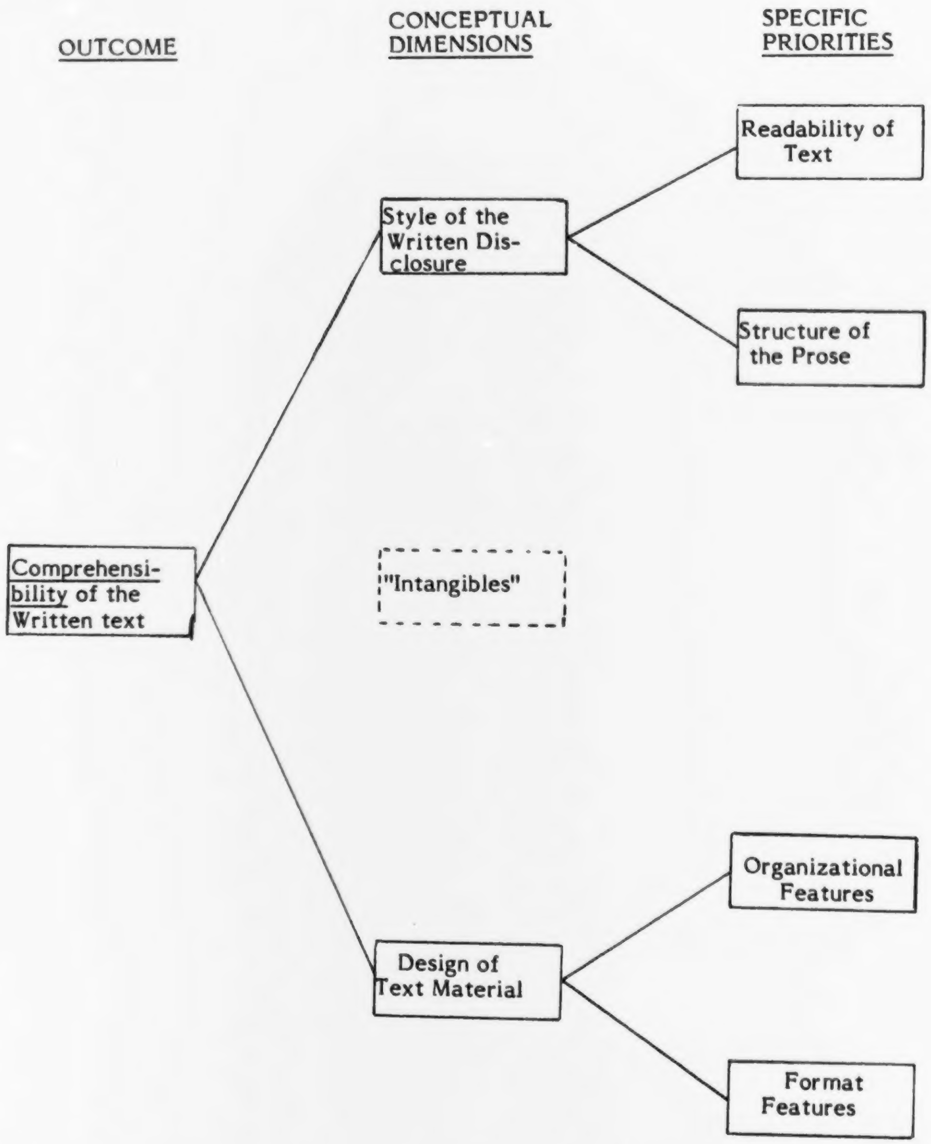
OUTCOME
CONCEPTUAL DIMENSIONS
SPECIFIC PRIORITIES
Readability of Text
Style of the Written Disclosure
Structure of the Prose
Comprehensibility of the Written text
"Intangibles"
Organizational Features
Design of Text Material
Format Features

Figure 16-1. The elements which lead to the increased comprehensibility of text materials.

Comprehensibility is identified as the seminal **Outcome.** Insofar as characteristics of (type-)written text are concerned,[1] Comprehensibility is viewed as being a function of two primary variables, referred to here as **Conceptual Dimensions:** (1) the **Style of the Written Discourse** and (2) the **Design of Text Material.** A third category, labeled **Intangibles,** was included in the schema to emphasize that several variables, principally learner-oriented, also affect the degree to which text material will be understood by the individual. However, since this category of variables will be treated only in relation to its impact upon specific textual dimensions as reported in the research, a different graphic format is used for its representation. The **Intangibles** category remains in the schema to call attention to the important roles that such factors as interest, motivation, prior knowledge, and learner skills play in affecting the comprehension of written text.

Having devised the schema from this initial perspective, and realizing the vast array of interdisciplinary possibilities available to us, the decision was made to stress functional subdivisions of those conceptual dimensions which were originally identified. This fundamental criterion of functionality directed our review of research to those areas which (a) are currently receiving considerable emphasis or renewed interest, (b) are likely to eventuate in the most meaningful and promising results, and (c) our own levels of professional expertise would enable us to treat with integrity. Admittedly, these focuses are judgmental, but in preparing this chapter we were quite conscious of one of the central issues that all writers of instructional materials encounter: deciding upon the boundaries or parameters of content (both breadth and depth of treatment). In concluding our schema, we delimited the factors subsumed under **Specific Properties** to "Readability of Text," "Structure of Prose," "Organizational Components," and "Format Features." Schematically, therefore, Figure 16-1 serves a two-fold function: it illustrates the framework we used in developing our chapter and it depicts an overview for the reader of the scope and sequence of our content.

A Note About Perspective

Implicit in this chapter are some notions concerning our point of view regarding the development of instructional text material. A more explicit statement is in order. Such a statement helps clarify our future discussion of the research findings and the categorical arrangements in Figure 16-1 which form the boundaries of that discussion.

Text material, first and foremost, ought to be written for the sake of communicating to the intended readership. It is this major orientation which resulted in the retention of the Intangibles dimension (see Figure 16-1) even though these variables are subordinated in the discussion which follows. Support for the importance of communication and suggestions for improving its clarity were found in a rather conventional source. Some of the guidelines abstracted from the research are **not** new, in the sense that English educators (teachers of writing) have espoused these tenets for over 50 years (Strunk and White, 1959). Significantly, a considerable amount of current research, particularly in the areas of readability, text analysis, and prose learning, lends empirical credence and corroboration to some of the tenets of composition writing which heretofore have been viewed as merely based upon conventional wisdom. Following these tenets tends to increase the clarity and style of written discourse towards improved readability.

In explicit terms, our fundamental premise may be stated as follows: **there is no viable substitute for well-written, clearly organized prose as far as maximizing the facilitative effects of written discourse.** This, we posit, is what the relevant research indicates to the practitioner who wants to move in the direction of applying empirical findings to the design of effective text materials. As writers ourselves, we intend to provide an explanation of what this means, support this contnetion through a comprehensive review of research, and wherever possible abstract principles which are applicable to developing prose material facilitative of the intended communication between the writer and the reader. It will also be made clear that the research does not permit a listing of extensive guidelines for text designers to use across all situations and all learners.[2] As far as is possilbe, the discussion below will present the research findings within a context which serves to allow a more workable interpretation of what is known about the effects of text design on comprehension. Following our overall discussion, we set forth considerations for further research which may yet lead to the discovery of that elusive list of definitive guidelines.

THE CONCEPTUAL DIMENSIONS

Within the framework of the schema presented above, there are two major **Conceptual Dimensions** which are directly related to increased comprehensibility by readers. These are (A) Style of Written Discourse and (B) Design of Text Material. Each of these demensions, as well as their respective sub-components, are described below.

Style of the Written Discourse

This section develops the first of the conceptual dimensions and the "specific properties" subsumed under this category. Figure 16-2 highlights these features within our overall schema. As illustrated, both ("Readability of Text" and "Structure of Prose") have been subdivided according to topical focus: the first into "Limitations of Readability Formulae" and "Readability as an Interaction Between Learner and Text"; the second into "Passage Organization" and "Passage Sub-Structure and Style."

Readability of Text

Readability, or the level of difficulty of written prose, has attracted a great deal of attention from those who are primarily involved in communicating via the printed word. Greater efforts are being made to make written material more readable (i.e., understandable) to its intended audience. These efforts are in part directed towards reducing the level of difficulty of the text so as to enable readers to understand the meaning more efficiently. Because they provide a practical solution to the problem of estimating the level of difficulty, various readability formulae and similar conceptual devices have become the easiest means of predicting the readability level of a particular prose selection (Klare, 1974-75).

An examination of some of the commonly-used formulae reveals their tendency to use vocabulary and sentence length as essential elements in estimating passage difficulty. The Flesch

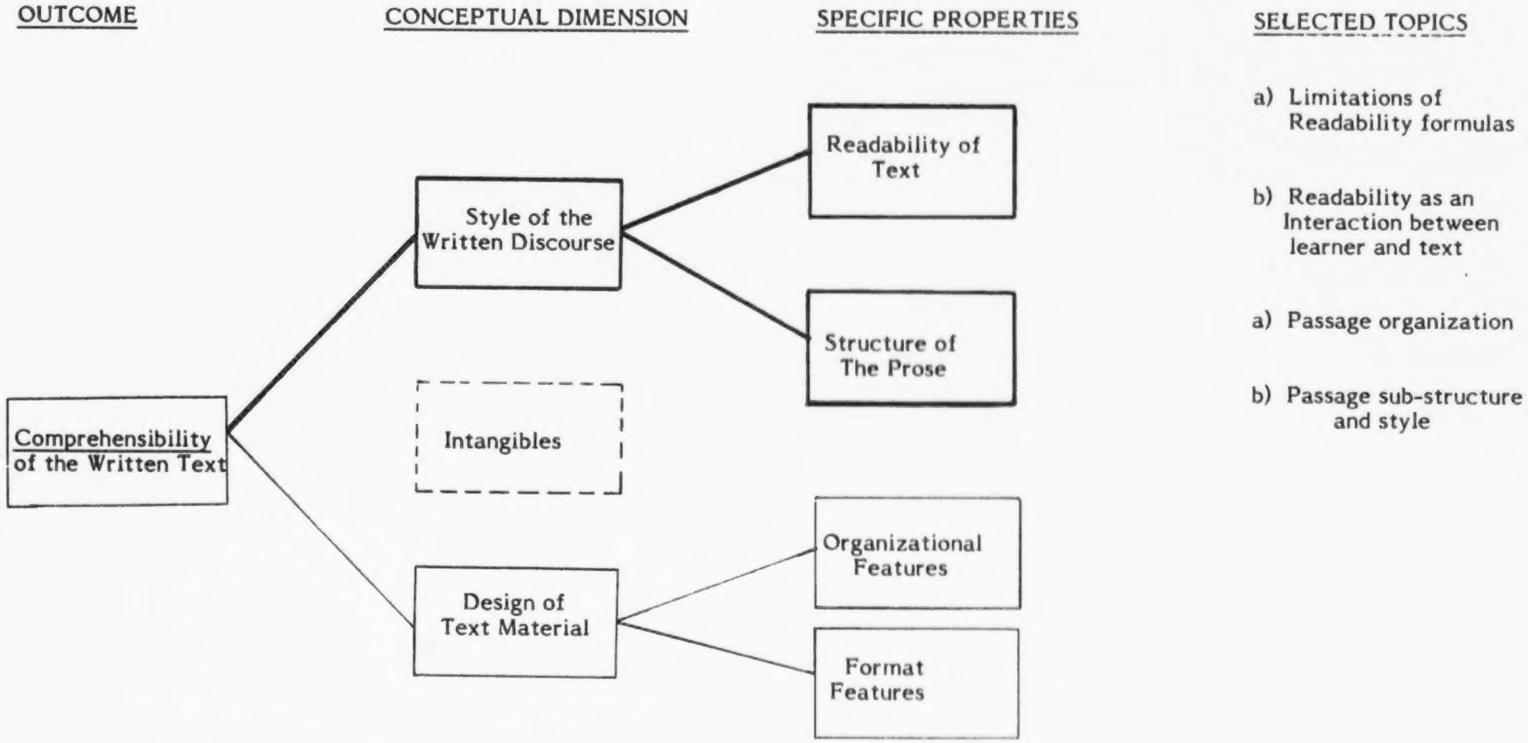
OUTCOME
CONCEPTUAL DIMENSION
SPECIFIC PROPERTIES
SELECTED TOPICS
Comprehensibility of the Written Text
Style of the Written Discourse
Intangibles
Design of Text Material
Readability of Text
Structure of The Prose
Organizational Features
Format Features
a) Limitations of Readability formulas
b) Readability as an Interaction between learner and text
a) Passage organization
b) Passage sub-structure and style

Figure 16-2. The elements which are related to the effectiveness of the "Style of the Written Discourse."

(1943) formula uses three factors: (1) average sentence length, (2) relative number of affixed morphemes, and (3) relative number of personal references. The Dale-Chall (1948) formula is based upon two variables: (1) average sentence length and (2) percentage of words not on the Dale List of 3,000 Words. This formula has been recognized as the most accurate estimator for printed prose materials above the fourth grade level (Hansell, 1976).

Because they are easy to compute, two more recent formulas have become popular among educators. The Fry Readability Graph (1968, 1977) involves counting the syllables and the number of sentences and then plotting them on a graph. McLaughlin's SMOG Index (1969) involves counting the number of words with three or more syllables over several sample sets of ten consecutive sentences. Used as tools, these formulae, like those cited above, are helpful for identifying the relative difficulty of a variety of prose materials.

Two exhaustive reviews of the research have established conclusively that readability formulae are sufficient to make relatively good predictions about text difficulty (Klare, 1974-75, MacDonald-Ross, 1979). This conclusion does not mean that readability formulae can show writers how prose should be written insofar as achieving congruence between their intentions and the expected effects of their material upon learners. By its very nature, the act of writing permits differential use of literary procedures to express the same message to different audiences. Yet these formulae can predict with reasonable accuracy whether the particular writing procedures employed in developing a given narrative are likely to result in a product too difficult for the expected readership. If the formula indicates that a narrative is too difficult, a writer may go back and revise the prose and then use the formula a second time. However, if the writer's real intention is to produce a more comprehendable prose, then the mere artificial manipulation of a few difficult words or the arbitrary division of a long sentence into two short sentences to comply with the formulae is not likely to reduce the **actual difficulty level** of the text. Unfortunately, and sometimes quite innocently, readability formulae have been misused in this manner by researchers, publishers and instructional designers.

Writers can never assume that by simply changing the predicted readability level, they have automatically changed the comprehensibility of that passage (Klare, 1976; MacDonald-Ross, 1979). As Pearson (1974-75) points out, one significant reason why such manipulations do not necessarily result in "easier" text is that readability formulae are based upon correlations. Manipulating the variables as causal rather than as correlational factors in predicting the level of text difficulty assumes qualities within the formulae that they neither do nor were intended to possess.

Limitations of readability formulae. Various misuses of readability formulae have led to much criticism in recent years. Nelson (1978) cautioned that textbooks are being selected on the basis of readability predictions alone without considering "whether the text communicates the essential facts, concepts, and values of the subject in a logical sequence, a sensible organization, or an interesting and attractive format." Readability formulae should not be considered infallible or definitive: they do not pretend to make a statement about the absolute appropriateness of the concept load for the intended readers (Estes and Vaughan, 1978). Other critics have been bothered by the lack of consistent results across formulae (Guidry and Knight, 1976). These formulae serve a specific but limited function: that of providing a rough estimate of the difficulty of written material. However, when used in conjunction with other tools and criteria, readability formulae can play a meaningful role in the selection and/or design of prose text. These criticisms, combined with the earlier cautions against artificailly adjusting the difficulty level of a particular piece of prose, are presented as a subtle series of limiting "do's and don't's" relative to the appropriate use of such formulae in reviewing text materials.

Readability as an interaction between reader and text. Klare (1976) scrutinized 36 experimental studies which manipulated readability level and then examined its effects upon reading performance or reader behavior. From this review Klare derived a model of major factors interacting with readability measures in affecting positive student outcomes. He argued that reader performance was a function of the experimental test situation interacting with four other important factors: (1) reader competence, (2) content of material, (3) readability level of material, and (4) reader motivation.

While these four factors were very important, Klare's analysis revealed that prior knowledge of and interest value to the individual learner also play critical roles in eventual reader performance. When previous knowledge of content was high, the effect of improved readability tended to be washed out (Klare, Mabry, and Gustafson, 1955; Funkhouser and Maccoby, 1971). Although the altered readability did not affect the comprehension of 'high-knowledge' subjects, they still preferred reading the improved versions. When the same materials were used with less-knowledgeable readers, however, differences in comprehension were significant in favor of the versions with lower (easier) readability levels. It appears that a reader's personal knowledge about and attitude towards a passage greatly influence whether the text material, particularly if it is extended text such as a chapter or textbook, will continue to be read.

Klare's (1976) review on readability firmly established the complexity of the relationship between readers and text. Hittleman (1978) has also argued for the complexity of the dynamics involved in this interaction. From this perspective it can be said with certainty that the readability level is not a stable or absolute quality of a piece of prose. The actual level of readability exists only in terms of the interaction between specific text and specific readers (Kintsch and Vipond, 1978). Hence readability measures function best as descriptive rather than as prescriptive tools, especially when used in conjunction with the preparation of written discourse.

The Structure of the Prose

The organization of prose or passage structure is separate from, yet closely related to, text difficulty. Until recently research in this area was limited by the lack of appropriate prose-analysis techniques.

Recent developments in linguistics (Fillmore, 1968; Grimes, 1975; Halliday, 1967; van Dijk, 1972) have facilitated the generation of several systems appropriate for the analysis of prose structure (Frederiksen, 1975; Kintsch, 1974; Meyer, 1975; Norman and Rumelhart, 1975). Within these systems, each idea and its role in conveying the meaning of a passage is identified and then represented on a heirarchially-ordered list or network. Meyer's (1975) prose-analysis procedure, for example, allows the researcher to arrange the content of a passage so that the most important ideas and relationships are at the top of a hierarchy and the least important ideas and relationships are at the bottom. The idea at the very top which holds the passage together is called the 'top-level structure' (Meyer, 1977). Several studies (Kintsch and Keenan, 1973; Kintsch, Kozminsky, Sheby, McCoon and Kennan, 1975; Meyer, 1971, 1975; Meyer and McConkie, 1973) have shown that information high in the passage hierarchical structure (superordinate ideas) is remembered better than information lower in the structure (subordinate ideas).

Passage organization. Writers have traditionally organized their information in a variety of ways. In terms of helping readers to remember information (Meyer and Freedle, in press; Meyer and Walker, 1978), some ways of organizing information tend to be more facilitative than others. The 'adversative top-level structure,' the one which compares two views, is **sometimes** more facilitative than an 'attribution top-level structure,' i.e., one which lists attributes of a concept. Results on the effectiveness of each structure have varied across studies with these variations being largely explained in terms of specific differences in the passage content and/or in individual learners (Meyer and Freedle, in press; Meyer and Walker, 1978; Brandt, 1978; Swanson, 1979). Other research on top-level structure indicates that time-order also may be a powerful way of organizing information contained within text material (Swanson, 1979).

Both expository and narrative prose have certain organizational conventions which appear to facilitate their recall for experienced readers. Thorndyke (1976) found that subjects improved their comprehension of a second story which retained the same structure as the first story. In a second story (Thorndyke, 1977), the amount of recall decreased as story structure decreased. It appears that as readers detect the author's organizational pattern in either narrative or expository prose, they use it as "identical scaffolding" to organize ideas within a systematic schema (Anderson, 1977). The organization a particular author devises can fundtion to provide the reader with a framework for interpreting the text. The structure which authors use to organize their text as well as the structures which readers use to interpret the text are denoted as schemata (Anderson, 1977). From this perspective, one is tempted to suggest that once psychologists found out how schooling can facilitate the acquisition, enrichment and manipulation of schemas, educators will know how to develop more-readable texts (Tuinman, 1980).

Research in content density and different organization patterns (top-level structures) has yet to result in definitive guidelines for prose design which are widely generalizable. Nonetheless, there is sufficient evidence accumulating from these lines of inquiry to suggest that such dimensions of text are to be reckoned with in terms of comprehensibility. For example, it would seem that writers need to exercise a conscious effort to structure their flow of ideas in a clearly discernible pattern so that whatever they consider most important recieves appropriate emphasis. to literally "bury" significant information by placing it low in the content structure enhances the probability that it will, by definition, lose its significance.

Others have associated text difficulty with the degree of internal coherence of a passage (Kintsch and Vipond, in press). In one study they found that as the number of different arguments (concepts) increased, readers took longer to read the passage. Apparently, when arguments are repeated readers are not required to reorganize as much information or make as many inferences. This redundancy seems to put less demand upon Short-Term and Working Memories to be constantly dealing with new information (Stahl, 1979). This principle was demonstrated when two speeches used in the 1952 presidential campaign were compared in Kintsch and Vipond's work. Even though the Flesch Reading Ease Formula indicated they were at the same difficulty level, when cohesion was analyzed Stevenson's speech was found to be more difficult. Stevenson's speech required the listener to make more inferences in order to establish connections between and among ideas. On the other hand, Eisenhower's speech contained a single coherent network of ideas, and therefore was easier to understand. An important factor in the cohesion of the Eisenhower speech was the repetition of the same information, though care was taken to make each restatement appear to be "new." At this time, the research findings relative to extent, kind, or amount of redundancy within each given text material provide no clearcut statements as to when this factor becomes nonfunctional in improving comprehensibility.

Part of the structure and "togetherness" of the flow of the organization of text concerns the way in which the various elements of the text connect to one another. For this reason it is not surprising to find the use of specific linking words as being positively related to comprehension (Rosenshine, 1969). Since such phrases pinpoint structural relationships between ideas and information, function words such as "if..., then..." and "because..." which link two clauses have been shown to facilitate comprehensibility. It seems that such cues as "if..., then..." provide natural linkages between ideas, concepts and facts, thus adding to the cohesiveness of the entire narrative. As Winter (1971, 1974, 1977) confirms, when writers fail to signal adequately the connections between clauses, this fragmentation of the elements within the prose structure itself creates confusion within the reader.

Moe (1979) has advanced a cogent explanation of how cohesion, which linguists consider a measurable phenomenon in discourse, interfaces with other language variables to affect coherence. Based upon an analysis and interpretation of works by Gutwinski (1976); Halliday and Hasan (1976); Perfetti and Lesgold (1977); Fishman (1978); Marshall and Glock (1978-79); Frederiksen (1977); Kintsch and Vipond (1978); and Kintsch and van Dijk (1978), Moe contends that "the cohesive ties which bind or bridge sentences semantically enable the reader to establish coherence in text and therefore account for a large portion of...comprehensibility in written discourse."

Connecting clauses represent one element within prose organization. Other elements, such as explicityly stating the main idea, represent more obvious efforts to increase comprehensibility. Some researchers (Marshall and Glock, 1978-79) have recommended that readability indexes would be improved by adding an index of explicitness. This conclusion was drawn from a study in which readers remembered more from passages with explicitly-stated information, even though the implicit sentences were shorter and had lower readability levels. These researchers further recommended that writers of instructional materials make all important information explicit to the reader (also see van Blaricom, 1979).

Although explicit writing facilitates comprehension, there is disagreement as to the benefits of explicit headings and the use of other external structural forms, used within text material. MacDonand-Ross (1979) argues that too much attention has been placed upon the use of organizers, objectives, and adjunct questions as separate, almost independent factors in text readability and design. To him well-written prose should be capable of capturing and maintaining the attention of the reader on its own merits. From his perspective, there are few real substitutes or facilitators for the skill of the writer in the development of quality instructional materials. As a case in point, regardless of all the design variables used, people rarely read boring, ambiguous, poorly-written prose.

Previously, attention was not focused upon studying the effects of the structure of text material, but rather upon mediational elements such as adjunct questions and objectives used to complement existing prose.[3] Reports of the benefits of instructional devices such as those just mentioned have been called into question by some researchers (Thomas and Swanson, 1979).

MacDonald-Ross (1979) also disagrees strongly with the emphasis Rothkopf (1976) and others have placed upon the individual learner's mental activities as affected by adjunctive devices, without at least taking into account the potential effects of the structure of the written material. According to Rothkopf (1976), when designers create devices for shaping and maintaining the mathemagenic activities essential for understanding poorly-developed text, difficult-to-read material in many cases may be used as an acceptable (or at least workable) instructional alternative. Consequently, slipshod work by writers, instructional designers, and publishers merely require more effort (i.e., intervention) on the part of the teacher for a given level of results.

It is important to view Rothkopf's contributions to comprehensibility as focusing upon compensatory variables affecting text material and understanding, i.e., variables of learner-and-text interactions which compensate or correct for already-existing, poorly constructed, instructional materials, as opposed to prescriptive guidelines for developing new prose materials. Within this orientation to Rothkopf's work, on an applied level, his emphasis on mathemagenic activities suggests a search for functional tools that individuals can and do use to better comprehend poorly-written, vague, and/or ambiguous text.

Clearly, such a focus treats text as something static rather than something dynamic. Practical application of such findings generate notions of how to mediate between learner and text. Such a view, though functionally attractive to the classroom teacher, is directed at palliative treatment--it does not address the critical issue: the search for more-comprehensible material which attains this property because of the original efforts of the **writer** rather than because of the subsequent work of the mediator.

Passage sub-structure and style. Besides looking at the organization and style of the entire text narrative, considerable research has been conducted which has focused upon individual sentences as elements of the whole text. Analysis of this research, including those by Gibson and Levin (1975) and by Hartley and Burnhill (1977), suggests that the following guidelines are appropriate for effective sentence structuring in text material:

(a) Short sentences are easier to understand than long ones. According to the research, few sentences should have more than one subordinate clause (Miller, 1964; Wright and Barnard, 1975).

(b) When possible, sentences should be written in the active voice. Individuals should try to avoid connections such as "except," "or," "if," and "unless" **within** the sentence (Davies, 1972; Wright and Barnard, 1975).

(c) In general, the use of negatives, particularly double negatives, should be avoided (Wason, 1965; Davies, 1972).

(d) As possible, the subject and verb should be together rather than separated within the sentence (Fry, Weber, and DePierro, 1978).

(e) **Be relevant.** Writers should avoid digression and irrelevancy (i.e., poor associations between prose elements and the main ideas).

Within this context, the need to develop clear associations between abstractions and concrete examples has been supported by Gibson and Levin (1975). They argue that abstract verbal material on almost any topic is more difficult to comprehend than is concrete material. The writer who deliberately provides numerous concrete examples and uses concrete nouns is facilitating the comprehension of the text by her/his readers. To emphasize the importance of abstractions to comprehension, Harris and Jacobson (1979) suggested that readability formulae would be improved greatly were they to provide a reliable measure of abstractness.

The above elements in prose have been shown to contribute to or reduce reading difficulty. The suggested remedies are provided to help writers reduce the difficulty of their prose. Further research, however, is needed to define more precisely the effects of specific numbers and types of violations in specific types of written materials for specific types of learners. Thus, the above, like so many of the findings from this area of research, only suggest some general guidelines which are tentative in relation to a particular audience using a particular type of prose.

Design of Text Material

In addition to the style of the prose itself, there are a number of other factors which may complement and supplement the prose so as to enhance text comprehensibility. In the original schema these were referred to under the heading of Design of Text Material and are further delineated in Figure 16-3.

Two categories of text elements fit under the broad area of Design: (1) Organizational Features and (2) Format Features. Each of these is expanded upon below.

Organizational Features

Organizational Features include all those elements that serve as devices for signaling the reader that s/he should attent to some significant aspect of the text (Meyer, 1979). These devices serve either informational (content-oriented) or structural (pertaining to organization) functions. Properties subsumed under this category include such diverse elements as adjunct questions, advance organizers, statements of objectives, and propositional cues found within the writer's language structures. The commonality found among these elements is their functions within written discourse. For the sake of clarity, these elements are presented in two sub-categories: (a) Intra-textual cues and (b) Adjunctive elements.

Intra-textual cues. Extending Meyer's conceptualization (1975), we coined the term "intra-textual cues" to denote signaling devices that are an integral part of the flow of written discourse and that emphasize specific aspects of the semantic content. This category includes two types of cues: cueing words/phrases and imbedded questions. These devices were not included as part of our previous discussion (i.e., style of writing) because, as Meyer (1975) suggests, they do not add new content and relations but simply accent information already contained in the content structure.

By delimiting these elements according to function, we correspondingly have limited the amount of relevant research for review. That is, only a limited number of researchers have generated inquiry from this same perspective. Meyer (1975), for example, included these types of signaling devices in her work with college students and found only a tendency for their facilitative effects with written prose. However, Marshall's (1976) results indicated that statements containing explicit cueing of ideational relationships were effective in the facilitation of learning among community college students. With junior and senior high school subjects, words or syntactic units that cue semantic relations and/or imply organizational patters may or may not prove to be facilitative (Meyer, Brandt, and Bluth, 1978). In this latter study the critical elements apparently affecting outcomes were learner-oriented variables.

In a quasi-experimental study with junior-high aged subjects, Thomas (1978) investigated the effects of imbedded questions (cues) within text material. These intra-textual cues were largely rhetorical in nature, as per the following example:

> ...The French and English-speaking Canadians are organized as one country. Two cultural groups in one political society make for complications in Canadian affairs, as you will read in chapter six. Can you think of similar examples? (Jones and Murphy, 1971).

Presenting versions of the same text with and without such cues, the only differential effects

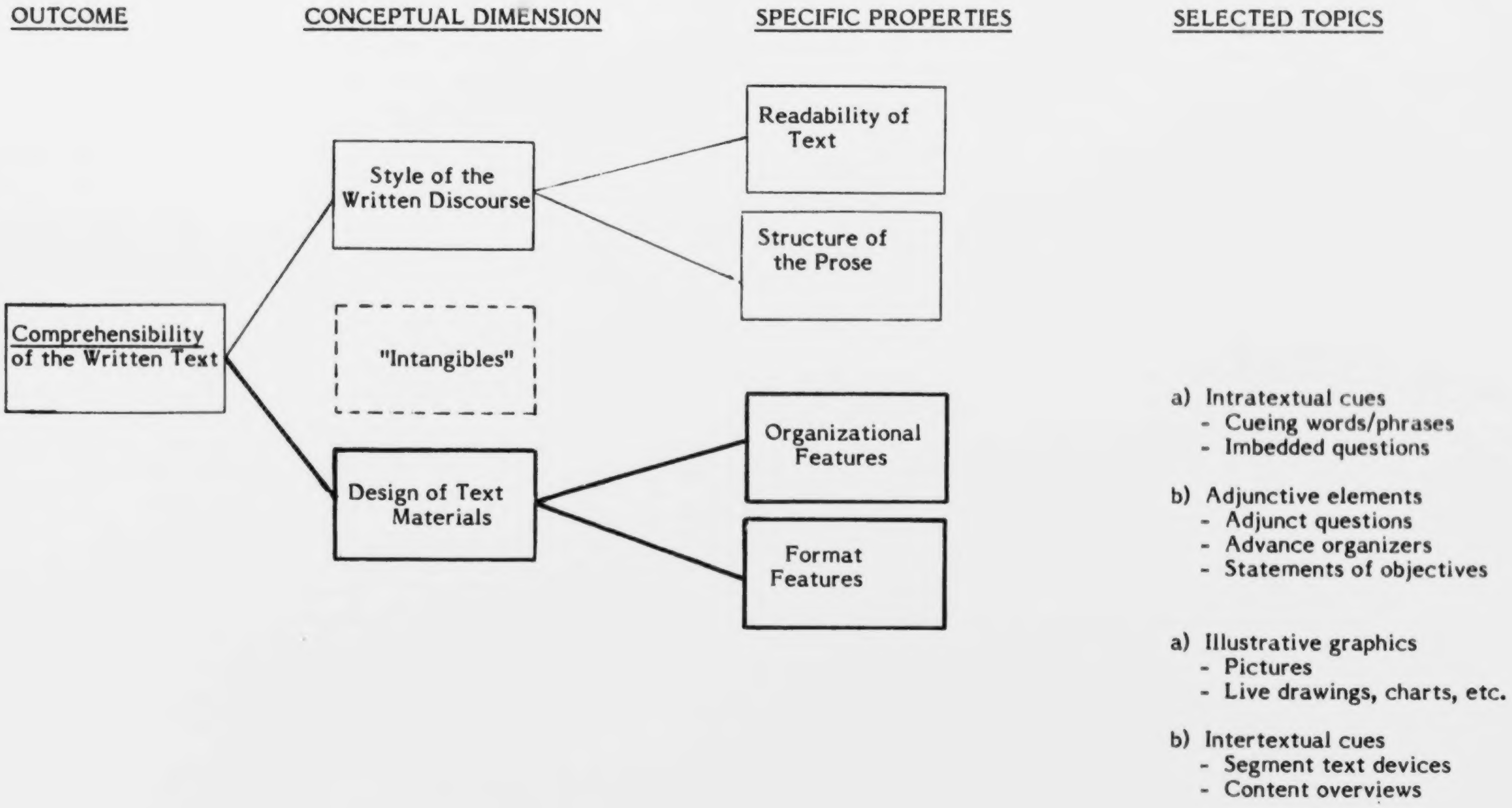
OUTCOME
CONCEPTUAL DIMENSION
SPECIFIC PROPERTIES
SELECTED TOPICS
Comprehensibility of the Written Text
Style of the Written Discourse
"Intangibles"
Design of Text Materials
Readability of Text
Structure of the Prose
Organizational Features
Format Features
a) Intratextual cues
- Cueing words/phrases
- Imbedded questions
b) Adjunctive elements
- Adjunct questions
- Advance organizers
- Statements of objectives
a) Illustrative graphics
- Pictures
- Live drawings, charts, etc.
b) Intertextual cues
- Segment text devices
- Content overviews

Figure 16-3. The elements which are related to the effectiveness of the "Design of Text Material."

noted were attributed to subjects' preexisting skill-levels: better readers comprehended more than did poorer readers but no better than did their experimental counterparts. The same was true for poorer readers. When interviewed **ex post facto**, however, subjects at all levels of reading achievement reported favoring the versions with embedded questions on the basis that the material was "easier" to follow. The investigator attributed this to a "personalizing phenomenon" resulting from impact upon style (Thomas, 1978). This type of research should be extended with special emphasis on varying the amount of cueing and the type of achievement measures used. In the study just reported, only a multiple-choice test was used to assess content mastery.

Although reading authorities have emphasized the need for processors of written text to perceive such intra-textual relationships (Burmeister, 1974; Herber, 1970; Niles, 1965; Strang, McCullough and Traxler, 1967), research directed at manipulating these types of cueing variables is scant and findings are somewhat equivocal. Perhaps the most definitive and accurate statement of the current statue of findings on intra-textual cues has been advanced by Meyer (1979):

> ...(such) emphases may have little influence on students with high and low skill levels, but substantial effects on middle-range students and adults no longer in school. The research with college students indicated that these highly skilled students are affected substantially by signaling reflecting differential emphasis. This type of signaling appears to increase recall of the signaled information and depress the recall of nonsignaled information, especially nonsignaled information at equivalent or lower levels in the content structure. (Meyer, 1979).

As Meyer implies, the true significance of such signaling appears to be rooted in a variety of learner-oriented variables, including reader competency and processing strategies, prior knowledge, and general maturational levels. Since the body of research is relatively small, however, implications should be approached cautiously. The most conclusive implication one may generate is that the nature of the learner is probably the most significant factor in determining the actual impact of these intra-textual cues. (Note: This finding is similar to that derived from the research on "Style of Prose" presented earlier in this chapter.)

For individual writers, **there would appear to be no substitute for knowledge of the prospective readership with regard to these intra-text and inter-learner characteristics.** However, since these characteristics are not always discernible **a priori**, the field-testing of instructional materials for comprehensibility appears to be at the most appropriate compromise. In preparing materials for such an endeavor, several alternative versions with differential intra-textual cueing would be the most logical strategy for the writer/researcher to employ. This may sound like a trial-and-error approach, but it is most logical and in fact represents the editorial policies followed by most publishers when they employ professional reviewers or send research teams into the field to ascertain the strengths/weaknesses of prototypic materials.

Adjunctive elements. Adjunct questions, advance organizers, content overviews, purpose-setting statements and/or objectives are elements which we view as being contiguous to, rather than integral parts of, written text. Hence, we have included this diverse group under a single category. Although they, too, serve a signaling function, they differ form intra-textual cues in that traditionally they are spatially set apart or dissociated from the main body of written text.

Adjunct questions, an area of prolific research, had its genesis principally in the work of Ernst Rothkopf (1965, 1966) and Lawrence Frase (1967, 1968 a, b, c). The mathemagenic hypothesis (Rothkopf, 1970) which has emerged from this research attempts to explain how externally-introduced questions shape the internal-processing behaviors of readers as they encounter print.

In his excellent summary of research involving adjunct questions, Vacca (1978) points out that "adjunct researchers" in general have manipulated such variables as: (1) position of question, e.g., prereading, post-reading or interspersed (Rothkopf, 1966; Frase, 1967); (2) types of questions posed (Rickards and DiVesta, 1974); and (3) type and position of questions (Rickards, 1976). The amount of research accruing from this line of inquiry is overwhelming and the review of specific studies is beyond the scope of and is somewhat superfluous to the intent of this chapter. The numerous insights gleaned from this research have been well-catalogued elsewhere by Anderson and Biddle (1975) and by Faw and Waller (1976). An excellent synthesis may also be found in the work of Moorman (1980).

Due to the rigors of the experimental design employed in these studies, it is extremely difficult to generalize collective findings into specific applications for the writing and preparation of general text materials. Nevertheless a summation would include but not necessarily be limited to the following points:

1. Questions contiguous to the presentation of prose material can have a profound effect upon learning from text and upon the subsequent development of text-processing behavior in readers. However, **unless the questions are actually used by readers**, the effects of their placement, type, frequency or kind upon comprehension will tend to be learner-determined rather than designer-determined.
2. The desired effects of the encounter with prose text should be weighed

cautiously by those preparing instructional media. Writers must give careful consideration to (a) the types of questions and (b) their positional effects. Such decisions may influence the type and amount of learning that occurs: for example, short-term mastery of facts or generalizations (or both) versus long-term retention of these same types of learning manifestations.

Advance organizer research, a second prolific area, has its roots in Ausubel's theory of meaningful reception-learning (1963a, 1968). The advance organizer involves the use of appropriately relevant and inclusive introductory information to facilitate learning from prose materials. As Klausmeier and Goodwin (1966) note:

> The advance organizers are not topical outlines of the new material presented. Rather they are short expository passages that perform three main functions... (They) provide a general overview of the material, provide organizing elements, such as subconcepts, and point out how previously-learned related concepts are basically different from or similar to the new ideas presented.

Organizers are presented prior to the presentation of the text material to be learned. They are supposed to be formulated in terms already understood by the learner and should be presented in a conceptual form that is at a higher level of abstractness, generality, and inclusiveness than that of the new material (Ausubel, 1963b).

Making sense out of the findings of advance-organizer research for practitioners, whether classroom teachers or writers of textual material, is an extremely difficult task due to the plethora of studies generated and to the lack of uniformity on their controls and specific operational definitions. Again, a review of specific studies would be superfluous to the intent of this chapter, as excellent reviews already exist. Baker (1977), for example, has reviewed 52 relevant studies, while Barnes and Clawson (1975) examined 32 studies. (Editor's Note: see review by Newell in this volume). given the status of this research, particularly as deduced from the Barnes and Clawson review, it is no wonder that results have been mixed and are difficult to interpret on an applied level. Do advance organizers accompanying written prose facilitate learning? The answer is both yes and no.

In viewing the implications of these several related research areas, a more meaningful approach for writers of text has been offered by Meyer (1979). After a comprehensive cross-categorical synthesis of more recent studies, including those of Duchastel and Brown (1974), Kaplan and Rothkopf (1974), Rothkopf and Billington (1974), Rickards and Hatcher (1978), Lewis (1978) and Mayer (1978), Meyer suggests that when adjunct questions and statements of objectives follow the normal emphasis within well-structured text, they function in identical ways. They tend to facilitate learning for poor comprehenders, but tend to be unnecessary for skilled readers. With poorly sturctured prose, i.e., where information deemed important is not made readily apparent due to ambiguity in the content structure, they may be facilitative for readers of varying levels of competencies. The same generalization may be said of the advance organizer research regardless of the operational definitions utilized in various studies. As Meyer (1979) suggests, the structure of a well-written passage may itself be a sufficient organizer for the information in the text. An additional organizer presented before the reading of a well-organized passage "may simply provide redundant information, waste the reader's time, and not add to the learning."

In other words, there is probably no substitute for text material that has discernible structure, with ideas appropriately ordered hierarchically and their superordinate-subordinate relationships clearly manifested. Therefore, whether such adjunctive devices are always appropriate or necessary in developing textual material cannot be answered with a definitive "yes." The answer appears to hinge on the interaction of the learner (with his or her characteristics) and the particular text material in light of the desired learning outcomes proposed by the writer.

Format Features. The property referred to as "Format Features" (See Figure 16-3) is subdivided into two categories: (a) Illustrative graphics and (b) Inter-textual cues. The former includes graphic components which are designed to illustrate some aspect of the content developed within the text. The most frequent examples are pictures (photographs), line drawings, charts, graphs, tables, and the like. Inter-textual cues (e.g., subheadings) are elements which generally segment the text into shorter idea units, or present content overviews (such as outlines and various forms of graphic organizers). While inter-textual cues often consist of some form of truncated language, they may be combined with other aspects of visual or graphic displays such as diagrams.

Illustrative graphics. Similar to the results from adjunct questioning and advance organizer research, investigations on the effects of pictorial representations upon written prose comprehension have produced mixed results. This led Haring and Fry (1980) to synthesize findings from eight different studies involving pictures, using Glass's (1976) "meta-analysis" technique. Results of their analysis, which included the work of Dwyer (1967), Fry, Haring, and Lagomarsino (1980), Haring and Fry (1979), Lagomarsino (1979), Miller (1938), Peek (1974), Rasco, Tennyson, and Boutwell (1975), and Weintraub (1960), indicated that pictures had a relatively small facilitative effect upon learning. However, Haring and Fry suggest the need for further investigations involving the use of pictures within different types of prose.

More-detailed reviews of the role of graphic materials have also been completed by MacDonald-Ross (1978) and Hartley and Burnhill (1977). Hartley and Burnhill's review is particularly useful since they catalogued their results in order to provide guidelines for text preparation. The following suggestions are abstracted and paraphrased from their review:

(1) Flow charts and decision maps may be more effective than complex instructions written in prose form, but variables such as the topic, conditions of use, and skill of user (reader) are critical factors in what is ultimately learned (Davies, 1972; Wright and Reid, 1973; Blaiwes, 1974; Hartley and Burnhill, 1977).

(2) Tables vary in purpose and complexity. Depending upon these factors, tables should provide wherever possible all of the information necessary for the learner to use them. (Wright and Fox, 1972).

(3) Graphs, like tables, may also serve differing purposes. Generally, line and bar graphs are easier to understand than other types (Schutz, 1961; Feliciano, Powers, and Kearl, 1963).

(4) Legibility of graphic aids may be inhibited by words set at an angle to the horizontal axis (Hartley and Burnhill, 1977).

The selections above merely touch the surface of Hartley and Burnhill's list. Those interested in more detail or elaborations, as well as research on relevant typography, are encouraged to explore this document. However, the reader is coutioned not to interpret nor follow their guide lines as though they were applicable across all content areas, prose styles, and readers.

Although the effects of graphics have been researched under experimental conditions, it is difficult to be prescriptive about their inclusion in text for purposes of enhancing comprehensibility. This difficulty is partially due to the experimental parameters and limitations of individual studies. That graphics may have an important impact upon learners, however, seems to be an unequivocal point. In Campbell's (1979) study, for example, college students were asked to select the most readable text they had used in an education course. They chose LeFancois's The Philosophy of Teaching (1975). Among the factors cited by the students, though not necessarily in the order of importance, were: interesting, overall appearanc; well set-out, well-spaced print, interspersed with cartoons; and diagrams in close proximity to the text to which they apply. The two most significant factors indicated were: (1) the use of humor, and (2) the linking of the more-abstract concepts to familiar situations. Obviously, both of these factors can be embedded within textual materials through stylistic dimensions as well as through elements of design. Hence the use of illustrative graphics does not appear to be an either/or proposition and is contingent upon such factors as suitability to the topic, purpose, and learner ability to adapt to and utilize figural properties. It should be noted, howevever, that student self-reports as to what attracts them to a particular text does not necessarily identify factors which serve to help them comprehend the textual material itself.

Inter-textual cues. Inter-textual cues may range from such conventional features as titles and chapter subheadings to relatively uncommon aids such as structured overviews. Meyer (1979) considers titles as serving a cueing function similar to the properties in our category of Organizational Components, and cites the work of Kozminsky (1977) as support for their facilitative effects, particularly when titles reflect actual propositions set forth in the text. Although we have concurred in this presentation with Meyer's point of view upon numerous perspectives, we chose to classify titles and subheadings as inter-textual cues for two reasons: (1) they tend to segment longer text into shorter idea-units, and (2) they frequently are represented through truncated language.

In the review previously cited, Hartley and Burnhill (1977) have presented the most definitive set of recommendations concerning headings and titles. Again, we have elected to abstract their more salient statements.

(1) Concise titles at the beginning of articles provide an orientation for the reader and aid in subsequent recall (Dooling and Lachman, 1971).

(2) Subheadings and major headings, used with systematic spatial arrangement, facilitate the understanding of structure in complex text (Hartley and Burnhill, 1976).

(3) Headings and subheadings presented as questions may be more facilitative than declarative statements (Robinson, 1961).

The use of titles and subheadings could be clarified by further research focussing upon both position and type of headings within different forms of prose. the writer's purpose must be considered as well. It is interesting to note that extended literary works (e.g., novels), seldom if ever contain subheadings. Expository materials, (e.g. textbook chapters, this chapter) on the other hand, are seldom prepared without them. As Thomas (1980a) points out, published checklists developed for evaluating textbooks almost always include these elements as essentials. In related research with community college students, Thomas (1980b) has found that titles and subheads are often used by readers to ascertain the macro-structure of a given chapter. This finding supports Hartley and Burnhill's second recommendation.

One of the most interesting types of inter-textual aids receiving recent empirical focus is the structured overview. This overview was originally conceived of as a type of cognitive organizer by Barron (1969). Barron defined this graphic aid as a "visual and verbal representation of the key vocabulary of a learning task in relation to more inclusive or subsuming vocabulary concepts that have previously been learned by the student." Studies by Estes, Mills, and Barron (1969), Earle (1969), Barron and Stone (1974), Barron and Cooper (1973) have, in general, produced mixed results as to the facilitative effects of structured overviews upon content acquisition. Given these results, and since such aids are not necessarily limited to processing by the reader alone (i.e., teachers usually engage learners in a pre-reading discussion involving the overview), the effectiveness of such a device as a part of text remains in question.

Operating on "cognitive organizer" theory, other researchers have pursued the used of inter-textual graphics, principally investigating different types with specific populations. Proger, et al (1973), for example, have provided some support for sentence outlines, sentence outline summaries, and sentence underlining as facilitative aids. However, since facilitation was experienced only under various interaction conditions involving such factors as sex and anxiety levels, the result are inconclusive insofar as generalizing beyond parallel populations exhibiting similar characteristics.

In summary, it appears that some types of inter-textual cueing devices, as defined herein, may help produce text that is more comprehensible to some readers. As more text variables are subjected to empirical scrutiny, additional insights, and maybe even guidelines which are more generalizable, should accrue relative to the effects of such cues upon learners.

SUMMARY AND CONCLUDING REMARKS

As suggested by the title, this chapter sought to present to the reader those practical guidelines for developing textual materials which can be supported by empirical research. As originally conceived, it was hoped that an extensive list of specific "do's" and "don'ts" would illustrate many of the very guidelines the authors recommend you use.

Such a listing was found not to be possible. After an extensive review of the literature, only one conclusion was permissible: there exist no specific text design procedures or guidelines which hold true across all text materials, literary genre, and/or prose narratives for all learners.

Whether this statement is absolutely correct or whether it merely represents the state of the art at this time is uncertain. What is certain? The research clearly points out that, in the final analysis, comprehensibility is the direct result of interaction between the text material itself and the individual learner. Hence, concentrating upon text design features for their own sake is not likely to generate useful guidelines because it fails to consider learner variables which make use of or ignore these features. Subsequently, reviewers who present extensive list of universal guidelines without specifying the exact learner variables which make these guidelines functional must be viewed with caution.

Within the body of our text we presented some implications which we believe to be appropriate on the basis of evidence which has accumulated to date. We have avoided presenting these implications as though they were universals. Hence, many are justifiably qualified on the basis of the research contingencies from which they emerged.

Because this review has continually found factors subsumed under the "Intangibles" category to be highly significant, future research must continue to focus upon this area. Furthermore, we believe that the factor of "purpose" is particularly relevant, for purpose will largely affect how text is ultimately used. Research on How text is used, from just that pragmatic perspective, appears to be generally lacking. The concept of "purpose" must also be considered from the point of view of the writer. For example, if a text is actually only used as a reference tool, then research on featural components which may facilitate the efficient and accurate location/retrival of the sought-after information is especially relevant. Conversely, if a given text is intended and indeed used to develop essential concepts in systematic and sequential fashion, a research focus upon other dimensions of learning from prose may be more meaningful.

In all probability, when learner/writer purposes are incompatible, for whatever reasons, problems in facilitating communication are increased. If the purpose, (that is, intent of the text in terms of content, organization, and implementation) is not made clear by the writer, the chances of ambiguity are increased. On the other hand, the writer has little or no control over how a text is actually employed in instructional settings. Writers can only prescribe how they intended their material to be used.

How do we affect a resolution regarding this delemma? Do we merely wait for additional basic and applied empirical research to provide us with the much hoped-for insights leading to practical implications? In our opinion, the resolve rests in our original contention: There is no viable substitute for well-written, clearly presented, and well-organized prose as far as maximizing the facilitative effects of written text. The facilitative aspects of written discourse are no longer as nebulous as was once believed. Primarily as a result of prose analysis research, these aspects are becoming increasingly more identifiable and operational. It seems that well-written prose is quite capable of capturing and maintaining the attention of the reader, as intended by the writer, all by itself.

As a corollary to the above, it seems that many components being used in text design serve primarily to compensate for, rather than complement, poorly-written prose materials. There are few real substitutes for the skill of the writer in developing effective, comprehensible text. From this review, it would seem that, rather than concentrate so much upon identifying and perfecting supplemental compensatory elements of text, we would do well to develop writers who possess the skills needed to generate clear, precise and well organized prose. At the same time, consumers need to be educated so they are able to recognize these styistic qualities in written material. To the extent that we may have contributed to either of these we feel vindicated by our efforts in this chapter.

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NOTES

1. This chapter deals entirely with research with typed, printed-prose text materials and does not include nor can it be extended to include hand-written prose.
2. For individuals who desire an extensive list of guidelines, see Hartley and Burnhill (1977).
3. Adjunctive devices such as questions and objectives are treated in more depth later in this chapter under the sub-heading "Adjunctive Elements."

Chapter 17

What Is Learner Control?

M. David Merrill

Many of the current aspects of educational technology which are of general interest involve situations in which the assumption that all students should receive identical mediations of instruction is either untenable or unsupported. Examples of such situations include self-instruction, computer-assisted and computer-managed instruction, individualized instruction, and programmed instruction.

Much research has been conducted involving variables affecting such situations, and has been published under such headings as ATI, cognitive style, individual differences, and self-paced instruction. All of these topics involve arranging the choices among the various mediational tracts for the student, usually based upon some pre-measured student characteristic.

But what happens if the choice among the various possiblities is left up to the student?

This chapter examines several aspects of this situation, using the concepts of student-controlled instruction and display selection. A model for display processing is developed, and relevant research is reviewed.

WHAT IS LEARNER CONTROL?

One of the problems which has plagued educational research is the ambiguity of the terms which are used to describe instructional phenomena. **Learner control** describes some rather specific instructional conditions, yet there is sufficient ambiguity in meaning that differrent investigators using the term frequently refer to different instructional events. The first section of this chapter is an attempt to clarify the several meanings which the term **learner control** can assume.

Types of Learner Control

Content Control. The earliest use of the term **learner control** referred to the opportunity for a student to make content selection. However, even in this context there is sometimes confusion as to the extent of the learner's choice. It is standard practice from junior high school through university to allow students increased choices in choosing the classes in which they enroll. At the junior high level a student usually has a choice among two or three alternatives in addition to required courses of study. At the high school level a student often has the opportunity to select as many as half of the courses in which s/he enrolls. At the university the choice is almost unlimited, since the student can first select the particular university, subject to admittance requirements, and once admitted can select from a wide variety of curricula, and often, depending upon the area of specialization, can also select from a considerable number of elective courses. While the term

learner control connotes this curriculum choice, the use of the term in this context is rare. Curriculum choice in this broad sense is usually not what is meant by **learner control.**

The first introduction of the term learner control (Mayer and McCann, 1961; Mayer and Clark, 1963) referred to the opportunity for a student to sequence the objectives within a particular course of instruction in any order that the student desired. In these studies the instruction assumed a form of Socratic dialogue in which the student could inquire from a subject-matter expert concerning those aspects of the topic which the student felt s/he wanted to explore next. These studies showed that allowing students **sequence control** over the objectives of a course shortened study time significantly with no apparent loss in comprehension.

Control of Pace. Pacing, the opportunity to study a given unit or lesson as long as needed, is another educational variable which is connoted by the term **learner control.** However, as with curriculum selection, pacing has more frequently been referenced by other names such as individualized instruction, self-paced instruction, or dindividually progressed instruction rather than by the term **learner control.**

Display (Strategy) Control. Our own work has included content control and self-pacing but has also introduced and emphasized display or strategy control. (Merrill, 1973; Merrill, 1975; Merrill, note 3; Merrill, note 4; Merrill and Axtell, note 5; Merrill, note 6; Merrill, Schneider, and Fletcher, 1980.) An instructional display is a presentation of a single subject-matter idea. A display can consist of a general statement, such as a definition, a set of steps in a procedure, or a cause-and-effect proposition; or a display can consist of a specific example, such as a representation of a particular object or event, a demonstration of a procedure, or an illustration of some cause-and-effect phenomena.

The display is not equivalent to the physical form of its display. A novel, for example, may be a single display if the subject-matter idea is the plot of the novel; it may be a single page of the novel if the subject-matter idea is the illustration of typical sentence structures characteristic of the novel's author. If the concept consists of the definition of a particular species of tree, the display may be a photograph of the shape of a leaf or the tree (if the species is defined in terms of shape), or a series of photographs of the flower, of the seed and of the leaf-shape (if the species is defined in terms of a composite of these things). The display is always determined by the subject-matter idea, never by the physical form of presentation of that idea.

Display control is based on the assumption that an instructional sequence can be divided into a series of individual displays and that these displays can be categorized into a limited set of types each with unique characteristics. Display control exists when a student is provided a mechanism for selecting and sequencing those displays which s/he feels are required to understand a given objective. At least three types of display control are involved: selecting of the number of displays required for perceived mastery; control of the sequence of different types of displays; and selection of various displays elaborated to include information designed to facilitate the student's comprehension of the material presented.

Control of Internal Processsing. As implemented by most investigations, learner control has been limited to the learner's selection and sequencing of external stimulus material. Content control is the selection and sequencing of externally stated objectives; display control is the selection and sequencing of externally presented displays. Self-pacing implies that a student may take longer to process a given presentation than another student but the investigations in this area have also limited their concern to the manipulation of events external to the learner.

The term **learner control** also connotes the ability of the student to select and use a variety of internal processing strategies as s/he interacts with the presentations which comprise the instruction. Effective and efficient performance is a result of the interaction of these internal processes with the stimulus materials which have been selected for, or by, the student. It is likely that even in situations in which the presentations are selected for, sequenced for, and paced for the student, that s/he can still exercise a considerable amount of learner control. Those students who have developed effective internal processing strategies may be able to compensate for a wide amount of variance in the instructional displays presented to them; those students who have less effective internal processing strategies may be more subject to performance decrements as a result of inadequate presentations. Internal control of cognitive processing may enable students to perform much more adequately than would be expected and probably accounts for the limited effect that the manipulation of stimulus materials seems to have in many instructional situations.

Manipulation of Learner Control

Content Control. Previous investigations have provided content control by making available an array of content choices (segments, lessons, units) which the student can order in any way s/he wishes or, in some cases, which the student can skip should s/he feel that the material in a given component is already sufficiently understood. This type of control is hindered when the segments, lessons and/or units of instruction are sequenced for the student. Linear delivery systems such as lectures, videotape, tape/slide presentations, or movies make the reordering of content components difficult, assuring that most students will study them in the order given. Students can still elect to skip some components merely by "turning off" during a given presentation. This is easier in expository presentations than in presentations which require active student participation or responding.

Workbooks, textbooks, and other materials which are manipulated by the learner in a self-paced individualized-study mode enable him/her to exercise some degree of content control. Most students probably take the path of least resistance, however, assuming the teacher knows best and following the prescribed content sequence.

Display Control. Formal provision for display control is of relatively recent origin and has not been widely investigated. Our own work with the TICCIT[1] system (Merrill, Schneider, and Fletcher, 1980) provided for display selection and sequence control by means of rule, example, and practice buttons. In most instructional materials individual displays are often embedded in the instructional materials in such a way that their identification and isolation is difficult. Hence, the manipulation of primary-presentation display and sequence is not likely to occur in most instructional situations. However, recent workbooks, texts, tape/slides, and other individual study materials have begun to isolate primary-presentation displays, facilitating the student's ability to utilize those displays which s/he feels are needed and to skip those which s/he perceives to be unnecessary.

Conscious Cognition. Most learner control and other individualized instructional situations have not attempted to either monitor or manipulate the student's conscious cognitive activities. It is apparent that in this realm student choice is relatively independent of the delivery system. S/he can choose to use whatever mental processing seems to be appropriate for learning a given display whether that display is selected by the student or presented to the student by the instructional system. By the appropriate selection of cognitive processing activities a student may be able to compensate for a less-than-adequate display or display sequence. It may also be likely that many students do not use optimal processing in instructional situations. While it is difficult to constrain cognitive activities the student could be taught more appropriate processing and encouraged to use these strategies where appropriate.

Meta-cognition. Most individualized learning situations have involved adaptive models which are external to the learner. We often naively assume the student is following the prescribed model. But in addition to subject matter, students also acquire some internal theory about how to learn. This internal strategy is often ignored in investigations of learner control or individualized instruction. While direct control of a student's "how to learn" model is not likely to become possible, it is possible that students could be taught to use more appropriate adaptive models which would improve their performance.

EXTERNAL AND INTERNAL LEARNER CONTROL: A MODEL

We have recently completed a series of studies investigating the effect of learner control over presentation displays within a given lesson (NSF Project SED-76-01650; see the final section of this chapter for a summary of our findings). To some extent our findings were disappointing in that we did not find universal group differences favoring learner control of display selection and sequence. However, one observation was very striking. When students are given control over what display to study next, they use a wide variety of strategies, exhibit considerable differences in the number of displays used, in the sequence of these displays, and in the latency on the various types of displays. Even more striking, however, is that extensive correlation analysis between these various display selection variables and performance does not show any systematic relationships. For example, one student may use 20 displays to learn a lesson while another student may use 100, yet their performance is not significantly different. We also found that these divergent patterns of display selection do not correlate with typical measures of aptitudes such as GPA or ACT scores. This type of finding suggested to us that we could no longer ignore the cognitive activities of the student. It must be, because equally capable students seem to learn equally well from considerably different configurations of instructional displays, that what they do in order to cognitively process the information presented must differ as well.

It is postulated that there are four levels of conscious processing over which the learner can exercise deliberate learner control: content selection, display selection, conscious cognition, and meta-cognition. Content selection refers to a decision on the part of the learner about what objective (segment, lesson or unit) to study next. Display selection refers to a decision on the part of the larner about what type of presentation s/he wishes to study next. Conscious cognition refers to the mental processes the student uses to encode the information presented by a given display. Meta-cognition refers to the "how to study" model which the student uses to guide her/his interaction with the instructional system being used.

Figure 17-1 is a diagrammatic representation of these levels of processing. This diagram represents a maximum learner control system, such as the TICCIT system, for which the learner has both content and display control. Content selection, display selection, conscious cognition, and meta-cognition are all shown as rectangular boxes representing functions which are internal to the learner. Functions on the "external function" side of the diagram include the content array, the display array, and the adaptive instructional model which controls these presentations. Trapezoids represent potential outputs from the learner. The most typical is response latency or correctness-of-

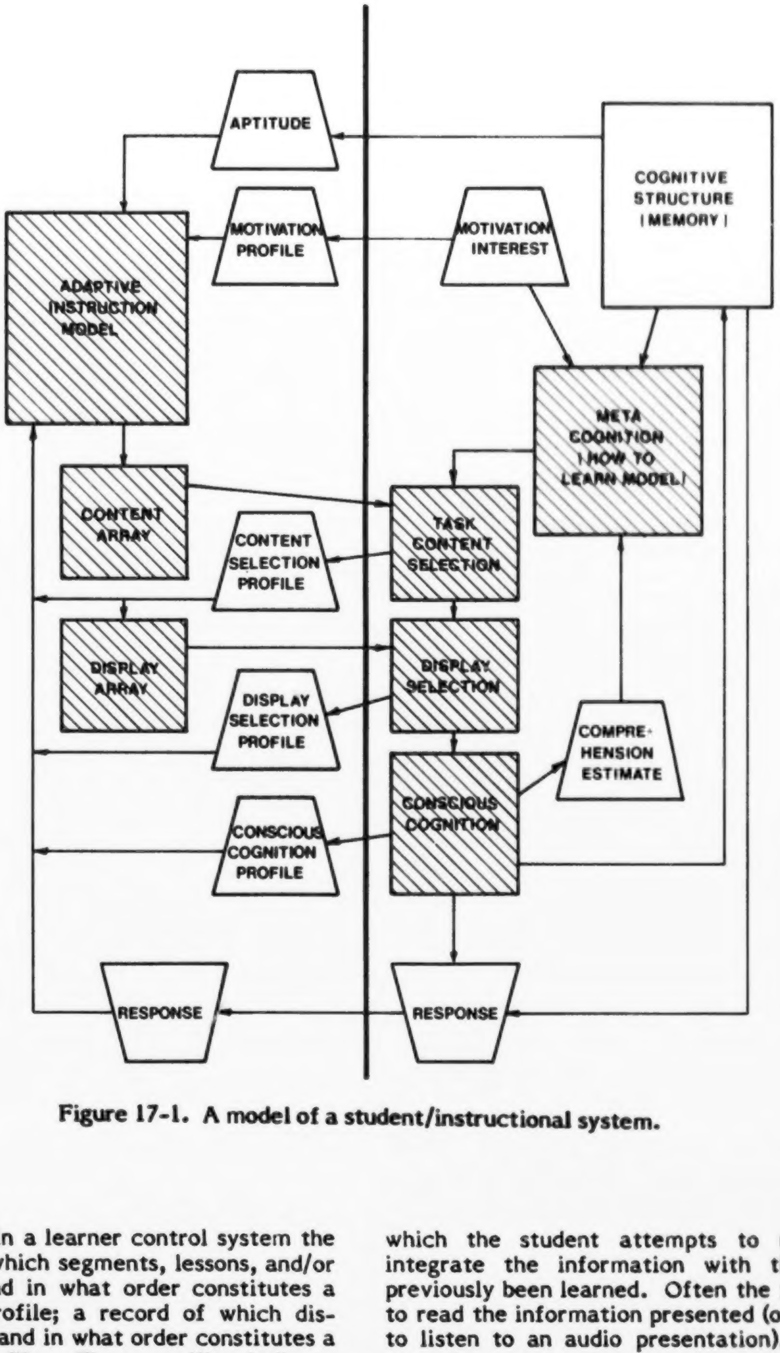

APTITUDE
COGNITIVE STRUCTURE (MEMORY)
MOTIVATION PROFILE
MOTIVATION INTEREST
ADAPTIVE INSTRUCTION MODEL
META COGNITION (HOW TO LEARN MODEL)
CONTENT ARRAY
TASK CONTENT SELECTION
CONTENT SELECTION PROFILE
DISPLAY ARRAY
DISPLAY SELECTION
DISPLAY SELECTION PROFILE
COMPRE-HENSION ESTIMATE
CONSCIOUS COGNITION
CONSCIOUS COGNITION PROFILE
RESPONSE
RESPONSE

Figure 17-1. A model of a student/instructional system.

practice response. In a learner control system the student's record of which segments, lessons, and/or units are studied and in what order constitutes a content selection profile; a record of which displays were selected and in what order constitutes a display selection profile. These profiles indicate the unique path which each individual takes through the material and has in the past been referred to as the student's individualized instructional strategy.

It is also possible to query the student concerning the way s/he processed the information presented on a given display. Figure 17-1 refers to this level of processing as a **conscious cognition.** Conscious cognition refers to mental activities by which the student attempts to remember and integrate the information with that which has previously been learned. Often the first activity is to read the information presented (or in some cases to listen to an audio presentation). The student may then engage in one or more of a variety of possible cognitive activities including: **rehearsal,** repeating the information several times from memory; **repetition,** rereading or relistening to the material; **paraphrasing,** reformulating the information in the studnet's own words; **imaging,** trying to form a picture using the information; **encoding via a mnemonic,** trying to incorporate the information into a formal or idiosyncratic mnemonic system; **exemplifying,** trying to find in memory a previously learned instance of the information; **covert practice,** trying to find a previously learned parallel to the information from some other subject area. If by an introspective interview we obtain a record of the processing attempted for each display then we have a conscious-cognition profile.

Meta-cognition refers to the student's personal "how to learn" model. Norman (1978) suggests that all students have some form of naive learning theory which they bring with them into a learning situation, but often their ideas are "quaint" and erroneous. In addition to processing the material as subject matter in its own right, it is postulated that students develop some model about how to learn within the individualized systems in which they find themselves. These models may be complete and systematic for some students yet incomplete or inconsistent for other students. Such models may be oriented toward content selection, display selection, or conscious cognitive processing. Such models are usually adaptive, enabling the student to adjust his content selection, display selection, or conscious cognition activities based upon internally perceived comprehension or upon external feedback. An example of part of such a model which may be used by a student is to feel that s/he should always look at a rule first, followed by one or more examples, followed by practice. An example of part of a conscious-cognition oriented model is the student who whenever presented a rule reads it three times and attempts to paraphrase it. As with conscious cognition, it is possible via introspective interview techniques to assess the meta-cognitive models being used by a student.

LEARNER CONTROL[2] AND INDIVIDUALIZED INSTRUCTION

There have been a large number of individualized instructional systems invented and explored. Almost everyone feels intuitively that individualized instruction is good and that learning should be better when instruction is somehow adapted to the unique abilities and aptitudes of the individual student. However, how does one compare one system with another? Are all individualized systems the same or are there significant differences in what constitutes the essential factors which are allowed to vary from individual to individual? Are all of these dimensions of individualization equally important or do some make a greater contribution to criterion performance than do others?

Individualized instruction means that aspects of the presentation are varied from one student to the next in an attempt to more adequately match the learning activities to the unique aptitudes and abilities of each student. Learner control means that adaptive instructional decisions are made by the student, as compared with system control, in which adaptive instructional decisions are made for the student. Individualized instruction always involves some form of learner control. In a previous section of this paper we suggested four levels of learner control. We would here suggest that an individualized instruction system differs with respect to which and how many of these levels of learner control are involved in the instructional situation. Two of these levels (display control and content control) are more easily manipulated by changes in the external instructional system than are the other two levels. Two of the levels (meta-cognition and conscious cognitive processing) are involved to some extent in almost any instructional situation. Not only is some form of learner contol involved in almost any instructional situation but also some level of individualization is also involved.

It was postulated in the first section of this paper that there are four potential levels of conscious processing over which the learner can exercise deliberate control: content selection, display selection, conscious cognition and meta-cognition (see Figure 17-1).

Individualized instruction and learner control involve the interaction of the functional components of an individualized instructional system with the four levels of conscious processing which have been identified. The degree of individualized instruction depends upon the parameter values which are assigned to the various functional components, that is, the content array, the display array and the adaptive model. The adaptive model used and the degree of selection and sequencing involved with the content and displays determine the external nature of individualized instruction. The degree of learner control depends upon the extent to which the learner can exercise each of the levels of conscious processing, i.e., content selection, display selection, conscious cognition and meta-cognition. Content selection and display selection are more directly controlled by the external environment, that is, by the type of adaptive model which is used and the delivery system by which the content array and display array are presented to the student. If the instructional system prescribes the sequence and selection for the content array, then the student has little opportunity to exercise content selection and thereby does not have learner control in the content selection process. Likewise, if the adaptive system prescribes the sequence and selection of the individual displays used to present a given content idea, then the student has little opportunity to exercise display selection, thereby being limited in the amount of learner control that can be exercised at this level of processing. However, in almost any instructional system it is difficult or impossible to completely control the degree of cognitive processing; therefore, a student in almost any instructional situation has control over the way to process the displays which are presented. Likewise, in every instructional situation the student uses some type of meta-cognition or "how to learn model." In a very real sense a student is adapting the instruction to his/her own needs no matter what the control or adaptation involved in the external instructional system. However, the number of choices which the meta-cognitive model must control are more limited in some instructional situations than in others. For instance, if the content and display selection and sequencing are made by an external adaptive model for the student, his/her own meta-cognitive model does not need to prescribe rules for the selection of content or rules for the selection of displays. Therefore, the student's internal model is limited to the control of the cognitive processing which s/he would use for the externally sequenced and selected content and display presentations which will be presented. Nevertheless, the student can still exercise considerable control over how to process the information once it is presented.

Comparing Non-Individualized Systems

In Table 17-1 we have attempted to compare a number of instructional systems on the basis of the nature of the adaptive system involved and the degree of learner control involved. One use of the model specified in Figure 17-1 is that it enables us to describe more precisely the nature of the individualized instruction and resultant learner control in a variety of instructional systems.

Lecture. A lecture is a nonadaptive instructional system. A typical lecture is an expository presentation of a number of content ideas. In this situation the content array is selected and sequenced for the student; that is, the lecturer has previously decided which topics to treat first, which second, which topics will be included, and which topics will be excluded from the presentation. The individual displays within each topic are also fixed in terms of sequence and selection. Typically in a lecture these will consist of a series of generality presentations followed by one or more examples. Except in an unusual situation there would be little practice provided for the student within the context of the lecture itself.

Table 17-1. Comparison of instructional systems on basis of learner control involved.

	EXTERNAL FUNCTIONS			INTERNAL FUNCTIONS		
	ADAPTIVE	CONTENT ARRAY	DISPLAY ARRAY	CONTENT SELECTION	DISPLAY SELECTION	CONSCIOUS COGNITION
1. TYPICAL LECTURE	NO	SC	SC	O	O	PC
2. TYPICAL TEXT BOOK	NO	SC	SC	PC	PC	LC
3. STYLIZED WORKBOOK	NO	SC	SC	PC	LC	LC
INDIVIDUALIZED SYSTEMS						
4. ATI (LECTURE)	YES	SC	SC	O	O	PC
ATI (TEXT)		SC	SC	PC	PC	LC
5. TUTORIAL CAI	YES	SC	SC	O	O	LC
6. ADAPTIVE MODEL (ATKIMSOM)	YES	SC	SC	O	O	LC
LEARNER CONTROL SYSTEMS						
7. LEARNER CONTROL (ATKIMSOM)	YES	LC	SC	PC	O	LC
8. SOCRATIC MODEL (MAGER ETAL)	YES	LC	SC	LC	PC	PC
9. TICCIT	YES	LC	LC	LC	LC	LC

KEY:
SC = SYSTEM CONTROL
PC = PARTIAL CONTROL
LC = LEARNER CONTROL
O = NO LEARNER CONTROL

The total system might include homework which may involve practice, or perhaps additional expository presentations via textbooks and other situations. For our discussion let us consider only the lecture component of this particular instructional system. The various types of information which typically could drive an adaptive instructional model are not typically available in a lecture situation. That is, there are usually no profiles on motivation, content selection, display selection, or conscious cognition. Except for homework and tests there are very likely no responses, certainly not on a display-by-display or topic-by-topic basis.

In a lecture the student has little opportunity for content selection inasmuch as the content is presented in a fixed sequence. It is possible for the student to take notes or hold in mind particular topics and to some extent reorder them, but this is not typically done by most students. The student also has little display selection opportunity. A student can "turn off" to a given part of the presentation by failing to pay attention and thereby exercise some degree of selection but typically the student can control neither selection nor sequence of the individual displays. In a small class a student may interrupt by asking questions, which might enable the student to exercise some degree of display and sequence selection by requesting an example or asking for a clarification of a definition. However, in a large group lecture this control is not typically exercised.

However, the student does have considerable control over conscious cognition. One limitation here is the pacing involved in a lecture. A student may wish to pause and paraphrase a particular generality but because the next generality is already coming from the lips of the lecturer the student may not have sufficient time to engage in the type of conscious cognitive processing that s/he may desire. Students sometimes attempt to provide this opportunity by taking notes but oftentimes these attempts are inadequate. Therefore, the manipulation of conscious cognition is possible, but the types of cognitive activities in which the students can engage are somewhat limited by the pacing in the situation. The lecture provides a sort of control group for our discussion in which there is little opportunity for learner control and no adaptation to the student on the part of the instructional system.

Textbook. Let us consider a conventional textbook. A textbook usually does not involve any type of adaptive instruction. The content selection and sequence is fixed; the array of the displays is also fixed. A given chapter will present a generality, some examples, and may have some thought questions, but the arrangement of these is constant and the expectation is that most students will begin at the beginning of the chapter and study the material through to the end.

However, a textbook provides considerably more opportunity for learner control than does a lecture. A student can select those topics which s/he wishes to study and can, by reading various sections of the textbooks before orthers, order them as s/he wishes. The headings and other textual cues enable the student to reorder the material in ways that may be more consistent with previously acquired knowledge.

To some extent a student also has more display selection opportunity with a textbook. However, display selection is often limited because generalities and examples are often embedded in elaborative material. It often requires considerable search activity on the part of the student to isolate the generality or the example. It may be necessary for the student to study all of the material in order to find the generality, example, or some other display component. This makes the selection and sequencing of such displays more difficult. The potential does exist, however, for the student to scan the material in search of a generality or in search of an example without paying detailed attention to the remaining material, thereby making some degree of display selection and sequencing possible. There is a considerable degree of control over conscious cognition which can be exercised on the part of the student, much more so for the textbook than for the lecture inasmuch as the study is self-paced. A student can locate and isolate a generality for a particular topic and then can take the time to paraphrase it, to rehearse it, or to engage in whatever conscious cognition s/he feels may be appropriate for processing the information presented. On the instructional side, a textbook is equivalent to a lecture, but on the learner side there is considerably more learner control possible with a textbook than is possible with a lecture.

Stylized workbook. A stylized workbook is similar to a programmed instructional booklet but does not have the typical "swiss-cheese frames" which were familiar to us during the 1960's. Instead, each topic is clearly identified by objectives which indicate the tasks which the student will be expected to perform following study. Each section which relates to a given topic has a generality page which clearly states the definition, the procedure, or the relationship being taught. On the following page, in a separate paragraph, is additional elaboration of the generality including its relationship to previously learned information. On a clearly labeled separate page are a series of example. These examples relate directly to the generality. the examples are clearly separated so that the student can see that there are a number of examples. On the same page or on an adjacent page additional information is provided for each of these examples to focus attention upon critical attributes and to indicate to the student how these examples relate to the generality. On another separate page are a series of practice problems to which the student is requested to respond. The practice is followed by a feedback page which indicates not only the correct answer for the problems but also provides additional help information as to why the particular procedure or concept which was taught was used or classified as it was.

There is also assurance to the student that the test which will be used to evaluate his/her performance will correspond very closely with the practice items.

In Table 17-1, we have indicated that such a stylized workbook is not deliberately adaptive. The content selection and sequence are fixed in that the designers indicate the order of presentation for the materials. The display arrays are also fixed in that the same displays are available for all students. However, in this case the amount of information available probably exceeds that which any one student is expected to need. This format encourages learner control.

On the internal side we've indicated a partial control over content inasmuch as the typical pattern is for a student to follow the topics in the order in which they are given. However, because each section of the book deals with a separate topic the student can easily rearrange these topics, therefore enabling partial control. There is complete learner control as far as display selection is concerned. A stylized workbook of this type is designed to provide display control. The isolation of generalities, examples, and practice items and the various elaborations of them enable the student to choose only that material which is needed. directions in the workbook encourage the student to skip additional examples if s/he feels s/he understands the material, to skip the help pages if s/he feels the examples are clear by themselves, and to work only as many practice items as s/he feels are necessary in order to assure him/herself that s/he understands the material provided. There is also complete learner control of conscious cognition. As with a textbook, a student can spend as much time on a given display as s/he may wish, thereby rehearsing, paraphrasing or engaging in whatever other cognitive activities are necessary to understand the material.

Comparing Individualized Systems

Aptitude-Treatment Interaction. Consider an aptitude-treatment interaction in which there are at least two treatments: one presentation for high-ability students and one for low-ability students. The differentiation between students is based upon some aptitude which has been assessed before the instruction is presented. An ATI is a form of an adaptive instructional model. It consists of two fixed models rather than of a dynamic adaptive model, in that the instruction is not adapted on-line as the student engages in the instruction, but rather a decision is made on the basis of an aptitude profile input and the content is fixed in two separate arrays, one for the first aptitude level and the other for the other aptitude level. In some ATI situations the content is fixed and the display array is divided into two different arrays, one for the high-ability and one for the low-ability students.

The amount of internal learner control available to the student in an ATI situation is more dependent upon the delivery system used than it is upon the fact that it is ATI. In the situation which we have just described, if the materials are delivered via lecture then the student would be considerably limited as to the content selection and display selection and to some extent the conscious cognition in which s/he could engage. If, on the other hand, the treatments are administered via textbook or workbook, the student has the degree of content selection, display selection, and conscious cognition previously described for texts or workbooks. In an ATI individualized-instructional situation adaptation has been accomplished by grouping the students, but the degree of learner control depends upon the delivery system.

Tutorial CAI. Tutorial CAI is typically based upon an adaptive instructional model which is performance or response driven. Students are given practice problems as part of the presentation and the next display is determined from the student's response. In many such systems the content array is fixed; that is, the selection and sequence of topics is decided for the students rather than being adapted to different students. There are exceptions to this, but for our example let us consider a situation in which the content array is fixed. The adaptation takes place within the display array. The adaptive model used is a general model; that is, the adaptation is the same for all students, but the particular frame which a student might see depends upon the nature of the student response. In a typical branching-type program a student would be given one type of display if his response to the previous frame was correct, but a different type of display if his response was incorrect. The display may vary depending upon the nature of the incorrect response.

On the learner side of the situation, if the content is fixed the situation is similar to a lecture. If the student does not have content selection, a CAI situation is less flexible than a textbook. Display selection is also fixed, in that the student has no direct control over which display s/he will see next. Tutorial CAI is even more limited than a textbook in providing the opportunity for the student to override the system, since s/he can only look at one display at a time. If is often impossible to reorder or select the displays which s/he would like to look at.

Tutorial CAI, because it is self-paced, does enable the student to exercise almost unlimited control of conscious cognition. A student can study a given frame for as long as necessary, thereby enabling him/her to engage in a variety of conscious cognitive activities. As an adaptive system tutorial CAI enables more learner control than does a lecture but less than does a textbook. It differs from either, however, in that an attempt is made to select displays on a frame-by-frame basis which are appropriate for a given student.

Adaptive Model. Consider the adaptive model described by Atkinson (1972) to teach German vocabulary to a group of students in an experimental situation. A list of 12 German words was projected in front of the room. A computer typewriter terminal typed the number of one of the words and the student was expected to type the English equivalent. The adaptive part of the system operated in such a way that the word to be tested was chosen by a computer program based upon two parameters: word difficulty and whether the word was permanent (that is, whether a student had really learned it or not), temporary (that is, partially learned but not completely learned), or unlearned. Permanency was determined by a student's response history and a mathematical model for calculating the degree to which the word was learned. The system was set up to optimize the number of permanently learned words that the student would have in her/his repertoire at the end of the experimental session and as demonstrated on a test in which he would be presented German words one at a time and expected to type the English word on the computer terminal. In a sense, this is an idiosyncratic adaptive model in that each student's response history is somewhat different, and therefore the word which a given student recieves next is different for each student, irrespective of his response to the immediate past item.

The selection and sequence of content in the content array was system controlled but was based upon an idiosyncratic adaptive model for each student. However, the display was exactly the same for all students and was therefore a fixed display. The display was a list of words, a number was typed and the student was required to type the correct word. Hence both the content and display arrays were system-controlled.

Internally, because of the system constraints, there is neither content nor display control. There is some partial control of conscious cognition. For example, the student can choose to rehearse the word several times, or s/he can choose to make a mnemonic out of it. The only limitation is the time involved and the limited display available to the student.

Comparing Learner Control Systems

Learner Control. By contrast, consider the learner control condition in the Atkinson (1972) experiment. In this case the situation was the same as described for the adaptive model, except that the student was able to choose, from the list of twelve words, which word s/he wished to respond to next, and to then type the response to that word, rather than having the system select the word. The comparison in Table 17-1 shows that the student has learner control of the content array instead of system control. The display array is still fixed; the student has no control of this.

Internally there is learner control as to content selection and sequence but there is no control as to display selection. There is about the same amount of partial control available for conscious cognition on the part of the student. The main difference between the two treatments was whether or not the computer selected the next word or the student selected the next word. It is interesting to note that this procedure represents a very limited type of learner control. The only controls available to the student were over which word to study next and some control over cognitive processing. All other functions were system-controlled.

Socratic Model. Consider the Socratic model as exemplified by the work of Mayer and McCann (1961). In this particular situation the student was given a list of objectives. S/he was then given access to a subject-matter expert tutor whom s/he could query concerning the objectives. The subject-matter expert essentially lectured to the student when the student chose an objective or when the tutor attempted to explain what the student wanted to know. The degree of Socratic dialogue involved here is unspecified in the description of the experiment, but presumably the subject-matter experts were instructed to provide only a minimum amount of information in the presentation and the student was to query additionally if s/he needed more understanding of the topic.

In this system the task is fixed; that is, the objectives are given to the student and the student is expected to master these objectives. The primary nature of the learner control was in the selection of content. The student could choose which objective s/he wished to work on next, could sequence the objectives in any order, and could choose to omit given objectives as s/he desired. We have indicated that the display array was fixed. To some extent this may be too strict, but it seems likely that the tutors in this particular situation gave a relatively fixed presentation when queried about a given objective. The presentations were probably very lecture-like in their nature; they probably presented the generality, and perhaps an example or a demonstration, for the student in the particular topic. The objectives were a comprehensive list at a high level of detail, each of them consisting primarily of a single topic.

On the internal side, there was learner control over content selection inasmuch as the student could choose which topic to study next and and could omit topics as s/he desired. We have indicated partial control over display selection. A student could ask the tutor for the additional examples, for a clarification of a generality, or for a different practice problem. The degree to which students engaged in this type of self-directed instruction is unclear from the description of the experiment but certainly is a possibility. For conscious cognition we have indicated partial rather than complete learner control inasmuch as the time involvement in the situation may have prevented certain types of processing. The student was probably under some constraint to respond quickly and not to spend too much time in processing the information given. This limits to some extent the type of processing in which s/he could engage.

TICCIT. Consider the TICCIT computer-assisted instrucion system (see Merrill, Schneider, and Fletcher, 1980). TICCIT is a complex learner-control system in which the student is presented displays on a television screen. The student can respond to the displays on a typical typewriter keyboard augmented on the right-hand side by a series of learner-control keys. The keys of primary concern in this description are the rule, example, practice, and help keys, by which the student can access various types of displays for a given segment or content topic. For each lesson, the student was shown a map which indicated all of the topics to be covered in a particular lesson. The student could select which topic s/he wished to study next and would then go to that topic, where s/he could select the types of displays which s/he would like to have presented to him/her. A student could also skip topics if s/he felt s/he understood them, and go directly to the test whenever s/he had worked on as many topics as s/he felt were necessary for his/her understanding. In this situation the student does have learner control over the content array. The student also has a relatively rich display array. S/he may decide what type of displays to look at, and how many. The student may skip displays, or may look at as many as necessary.

Under the degree of internal learner control we have indicated that there is complete learner control over the content selection, over the display selection, and over conscious cognition. Inasmuch as this is a self-paced system in which a given display stays on the screen for as long as the student desires, s/he may then have time to engage in any type of cognitive processing which is desired in studying the material. TICCIT is a relatively complete learner control system, both in terms of the external provision for control and in terms of the degree of internal learner control available to the student.

ADAPTIVE MODELS AND LEARNER CONTROL

An adaptive instructional model is one which allows for modification of the instructional strategy in response to inputs from the student. An instructional strategy can be conceptualized as a sequence of instructional displays. Thus an adaptive model is one which allows the kind and number of displays to vary from student to student and time to time during the instructional process.

Dimensions of an Adaptive Model

In an adaptive model the display selection procedures are based on certain assumptions about the relationship between student display performance or a student estimation-of-comprehension and the best display for a given student to receive next in a given instructional situation. There can be a wide variety of adaptive models which can vary on a number of different dimensions. Of concern for this paper are three such dimensions: model generality, locus of control, and driver.

Model Generality. Model generality refers to the idiosyncratic nature of the model. Does a given model apply to all students in a given instructional situation and under similar motivational conditions? Or does each student require an idiosyncratic model? Most tutorial systems assume a general adaptive model. Each student is presented the same display if a given practice item is missed. In contrast, an individualized model would present one type of display to student A but a different type of display to student B under the same display-performance conditions.

Locus of Control. Locus of control refers to who does the adapting, the learner or the system. In a learner-control model, the choice of the best display to be given next is made by the learner. In a system-control model, the choice of the best display to be given next is made for the learner. Tutorial systems are usually system-controlled. TICCIT (Merrill, Schneider, and Fletcher, 1980) is one example of a learner-controlled system.

Driver. The driver refers to that information which is used to make adaptational decisions. There are many different types of information which can be used to drive adaptive models. In this paper two sources of information are identified: student display performance and student estimation of comprehension. Student display performance includes correctness of response on practice frames and latency on displays. Student estimation of comprehension includes a student's prediction about test performance and expressions of readiness to take a test.

Presentation Displays

Display Types. We have previously suggested that an instructional strategy can be conceptualized as a series of displays (Merrill and Boutwell, 1973; Merrill and Wood, 1974; Merrill, Richards, Schmidt, and Wood, 1977; Merrill, Reigeluth, and Faust, 1979). This conceptualization allows the componentization of instruction and the systematic manipulation of instructional strategies. The primary presentation displays include, (a) **generalities,** such as the definition of a concept, the statement of a procedure, and the statement of a principle; (b) **examples,** such as instances of a concept and applications of a procedure or principle; (c) **generality practice,** which requires a student to recall or recognize a generality; and (d) **example practice,** which requires a student to classify an instance of a concept or to apply a procedure or principle to a given situation. These primary presentation displays include (e) **generality help,** which further defines components of the generality, represents the generality in another form, or illustrates the application of the generality to an instance; (f) **example help,** which uses attention-focusing devices to illustrate how the instance relates to the generality; and (g) **practice-feedback help**, which uses attention-focusing devices to show the student how the problem was solved.

Instructional Value. The instructional value of a display refers to the contribution a given display makes to test performance. A nonadaptive model assumes that a given display which is part of a given strategy makes a similar contribution to the test performance of all students. An adaptive model assumes that the instructional value of a given display is a function not only of the strategy of which it is a part, but is also a function of the student's display performance and/or the student's estimation of comprehension. A general adaptive model assumes that for the same student response or comprehension level, the same display makes a similar contribution to the test performance for all students. An idiosyncratic adaptive model assumes that for the same level of student response or comprehension, the same display makes a different contribution to the performance of different students.

Variables Contributing to Student Performance

The instructional value of a given instructional display is potentially the function of four classes of variables: display context, student display performance, student estimation of comprehension, and motivational context.

Display Context. Display context refers to the relationships between displays which exist within a given instructional strategy, regardless of whether the strategy was determined by a fixed or adaptive model, whether the adaptive model was system or learner-controlled, whether the model was general of idiosyncratic, or whether the model is display-performance or comprehension-estimate driven. Such relationships can be assessed in a wide variety of ways. Some of the measures which seem relevant are illustrated, but not exhausted, by the following:

A simple measure of display-context is the **number** of displays. One measure is the total number of displays presented. Under a fixed strategy there would be no variance on this measure. Under various types of adaptive models there could be considerable variance in the number of displays presented. Number of displays can be subdivided into the number of the various kinds of displays, i.e., number of generalities, number of examples, number of practices, number of generality-helps, etc.

A second measure of display-context is the **relationship** of various kinds of displays. This measure includes various ratios of the number of one type of display to the number of another type. Some of the specific measures include: example to practice ratio, example to example-help ratio, practice to practice-feedback-help ratio, etc.

A third measure of display-context is the **sequence** of displays. One such measure assumes a fixed-sequence model such as generality, generality-help, example, example-help, and practice, practice-help. The actual sequence is compared with the fixed model and a deviation score is derived. Various measures could be derived by assuming different fixed-sequence models as the base.

Various other display-context measures could be derived. The above are sufficient to indicate the type of variable being considered.

Student Display Performance. Student-display performance refers to the various indicators of how the student is processing the information which is being presented via the displays. These measures are also independent of the models used to present the instruction, but may be affected by the model being used. Some of the indicators of student display performance which seem relevant are illustrated by, but not exhausted by, the following two measures:

Instructional Time represents one display-performance measure. At the most general level the total-time-to-learn is one such measure, and it can be partitioned in various ways such as time on various types of displays: rule-time, example-time, practice-time, etc. Various time-per-type-of-frame ratios may also yield useful performance information. Such measures might include generality-time to example-time ratio, generality-time to practice-time ratio, example-time to practice-time ratio, etc. These time ratios could be based on total time per type of display or on a time-per-display basis.

Correctness of Response on practice frames, Which has been the most common driver for tutorial adaptive models, is perhaps the most obvious display performance measure. there are several specific measures which could be used. Percent-correct-practice is perhaps the most obvious. Other measures include practice-missed to practice-feedback-help ratio, Practice-correct to practice-feedback-help ratio, recency scores, etc.

Student Estimates of Comprehension (EOC). Student estimates of comprehension (EOC) refers to the student's estimation of how well s/he understands the material which is being presented. There are various ways to assess this information. At present the following procedure seems most appropriate.

Each display could contain a 7 or 9 point scale. The student could be asked to respond to this question following each display: "If you were to be tested at this point in the lesson how well do you think you would do? At one end of the scale the descriptor would read "none correct;" at the other end of the scale the descriptor would read "all correct." After the first few frames, after the learner has become familiar with this assessment, the question itself could be ommitted and only the rating scale included in each display.

Following each display the student could also be asked to indicate whether or not s/he feels ready to take this test. Under some conditions this could allow the student to take the test. Under other conditions this would merely serve as an indication of readiness, with the model being employed determining whether or not the student is allowed to take the test at that point in the instruction in some other way.

Motivational Context. The contribution of each of the previous classes of variables to student test performance may likely be different under different motivational states. For purposes of this paper two motivational dimensions are proposed: level-of-aspiration (LA) and momentary-need-for efficiency (MNE).

Level-of-aspiration (LA) refers to the desire on the part of the student to get as many correct as possible. In real-world settings different students often have long-term differences in level of aspiration as a result of their success in their interaction with instructional situations. In experimental situations short-term level-of-aspirations could be manipulated by contingency management.

Momentary-need-for-efficiency (MNE) refers to a student's desire to complete the instructional task as soon as possible or his/her willingness to stay for a prolonged period of time. In real-world settings different external contingencies affect the momentary-need-for-efficiency for each of us. In research investigations momentary-need-for-efficiency could be manipulated by contingency management.

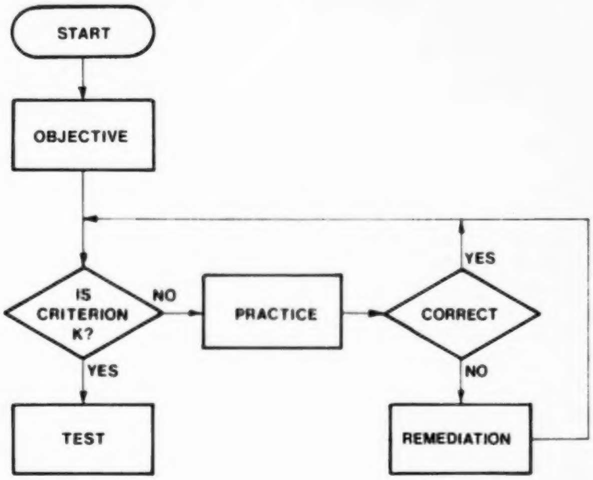


Figure 17-2. Performance-Driven remediation model.

Examples of Adaptive Models

A Performance-driven Remediation Model. The driver of this model is a correct or incorrect response on practice items. The model is remediation based. Depending upon the instructional context, the model could be either general-adaptive or idiosyncratic. The model could be either system-controlled or learner-controlled. The basic form of the model is illustrated in Figure 17-2. The model operates as follows: a criterion of k or k-in-a-row correct practice items is established. The student is presented an objective, including a sample test item. The student is next presented a practice item. If the student responds correctly to the practice item s/he is presented another practice item until s/he has met the criterion. If the response is incorrect s/he is presented some form of remediation and then presented another practice item until the criterion is met. The remediation subroutine could take several forms. One possibility would be as follows: first error, branch to practice-feedback-help display; second error, branch to example; third error, branch to example with example help; fourth error, branch to generality; fifth error, branch to generality-with-help. This branching structure would be reset after every correct response. The rationale for this model is to provide a lean instructional program; generality and example frames are provided only as remedial information when the student can't figure out how to solve a problem. Data from the TICCIT system (Bennion, 1978) indicates that many students under learner control seem to adopt a remediation model in their choice of displays.

EOC Driven Generality-Example-Practice Model. The driver of this model is the student's estimate of his/her understanding of the content being presented. Under system-control the driving mechanism might be as follows: the student would be asked to estimate his/her performance if a test were to be given immediately following the current frame (i.e., provide EOC). The model operates as follows: if there is an increase in EOC since the last display, shift up; if there is no change in confidence, stay; if there is a decrease in confidence, shift back. The basic form of the model is shown in Figure 17-3. The student is presented an objective and asked to give EOC. If EOC increases, the student is shown an example. If there is no increase, the student is shown the generality-help; and so forth as illustrated by the flow chart. We designed an "advisor" for the TICCIT system based on a variation of this model. In the TICCIT system the advisor provided a recommended display, but did not compel the student to be presented this display. This particular version of the advisor has not been completely implemented on the current operating TICCIT systems.

An EOC-Driven Model with a Performance Criterion. This Model is a combination of the previously described models. In this model the driver is EOC, conditional on having reached some specified criterion of correct practice. The basic form of the model is illustrated in Figure 17-4. The operation of this model is similar to that described for the EOC model in Figure 17-3.

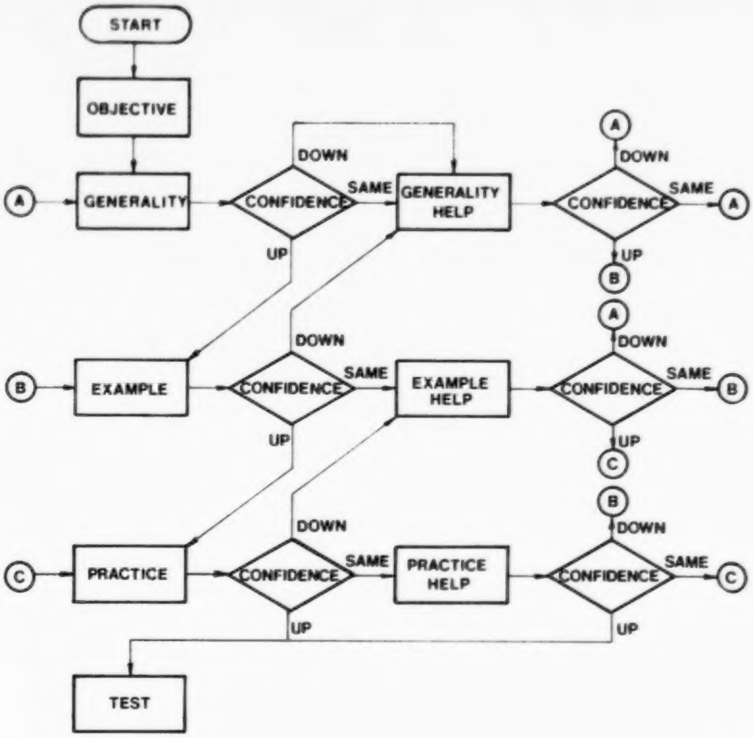


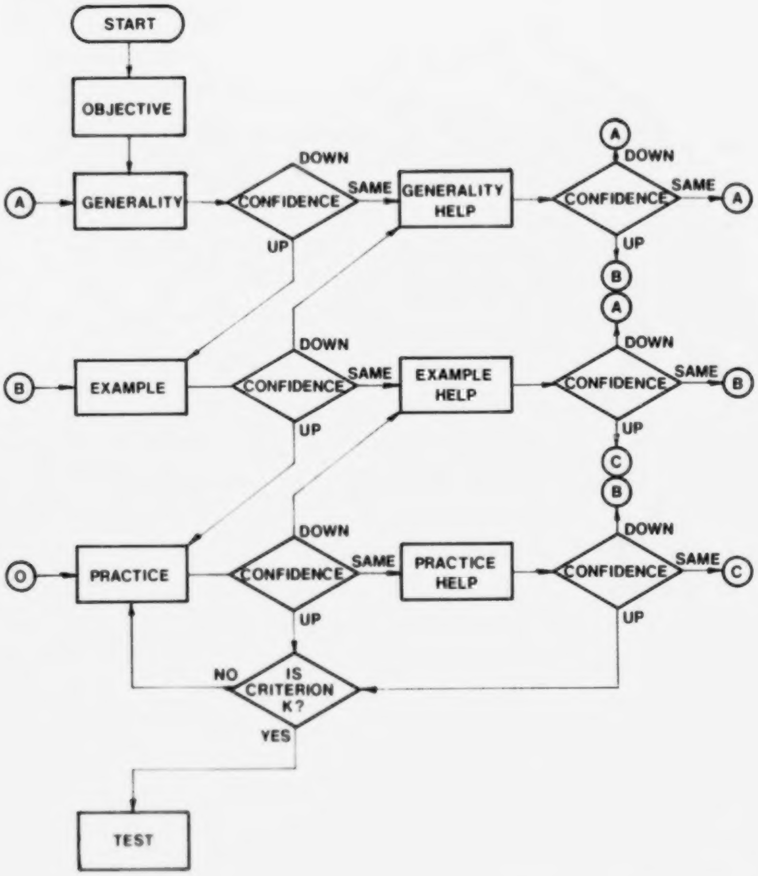
Figure 17-3. Confidence-Driven generality—example—practice model.

What Level of Adaptive Model is Necessary?

Three general levels of instructional models have been described. The first level includes non-adaptive models in which the instruction is the same for all students in a given instructional situation regardless of their display performance or of their estimation-of-confidence. The second level consists of a general adaptive model which adjusts to each student based upon the student's display performance or estimation-of-confidence, but the nature of the adaptation is the same for all students. The third level includes idiosyncratic adaptive models which not only adapt to each student based upon display performance or estimation-of-confidence, but the way in which they adapt differs for each student depending upon other individual-difference factors. For each of these levels of adaptation a wide variety of specific models can be identified depending upon the specific displays involved, upon the nature of the driver involved, and upon the locus of control.

Are Adaptive Models Necessary? If it can be demonstrated that test performance is determined primarily by display-context variables in that a certain combination of displays seem to promote maximum performance for all students under a given motivational condition, then it does not seem necessary to construct elaborate adaptive models. All that is necessary is to use strategies which implement the observed display-context and all students will demonstrate maximum performance. If, on the other hand, it can be demonstrated that test performance is contingent upon student display-performance or student estimation-of-comprehension in addition to display-context THEN adaptive models are necessary for optimal test performance.

Are Idiosyncratic Adaptive Models Necessary? If idiosyncratic models are not necessary THEN a system-controlled model is practical. a learner controlled model may still be desirable for other reasons (such as for learning how to learn or helping the student to become system-independent) but it cannot be argued that an idiosyncratic adaptive model is a necessary condition for learning the material in the optimal way. If, on the other hand, idiosyncratic models are necessary, THEN a learner-controlled model is more practical. This argument is elaborated as


START
OBJECTIVE
A
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DOWN
CONFIDENCE
SAME
UP
GENERALITY HELP
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UP
NO
IS CRITERION K?
YES
TEST

Figure 17-4. Confidence-Driven model with performance criterion.

follows. If every student requires a unique combination of displays in order to optimize his/her acquisition of a given lesson, then for system-controlled models the development costs begin to become unreasonable. An adaptive system-controlled model requires preassessment of every student to determine the appropriate idiosyncratic adaptive model. A very complex general program would need to be developed to allow programming the computer to implement this idiosyncratic model, or a separate, unique program would have to be prepared for each student. To be practical, a student would need to maintain the same idiosyncratic strategy over time. If the adaptive model was not only idiosyncratic amoung students but also idiosyncratic for the same student at different times and for different subject-matter contents, then preassessment would be at best temporary and the programming problem considerably compounded.

On the other hand, if a student can exercise learner-control then a general purpose program can allow the student to adapt the strategy to his/her own idiosyncratic needs, even if these needs change over time and occasions.

If research demonstrates that learner-controlled adaptive models are desirable then some additional questions need to be considered. If the necessary idiosyncratic adaptive models are driven by display performance then one needs to know 1) What information is necessary for a student to monitor his/her display-performance? 2) Can s/he monitor his/her display performance, given this information? 3) If not, can s/he be taught to monitor his/her display performance? 4) Can the student make the appropriate display choices, given that s/he can monitor display-performance? and 5) If not, can the student be taught to make the appropriate display choices?

If the necessary idiosyncratic adaptive models are driven by estimation-of-comprehension, then one needs to know 1) What information is necessary for a student to monitor his/her level-of-comprehension? 2) Can s/he monitor his/her comprehension, given this information? 3) If not, can s/he be taught to monitor his/her comprehension? 4) Can the student make the appropriate display-choices, given that s/he can monitor comprehension or be taught to monitor comprehension? and 5) If not, can the student be taught to make the appropriate display choices?

RESEARCH ON LEARNER CONTROL

Content Control

O'Neal (1977) reviewed a number of studies which investigated the student's ability to sequence units or modules of instruction within a course. (Allen and McDonald, note 1; Grubb, note 2; Judd, Bunderson, and Bessent, 1970; Thomas, 1971; Beard, Lorton, Searle, and Atkinson, 1973; Issing and Eckert, 1973; McCann, Lahey and Hurlock, 1973; Seidel, 1973; Mayer, 1976). Most of these studies support the finding that students who are allowed to sequence units or modules do at least as well as students who are presented fixed sequences, and when students are allowed to skip of skim modules which they feel that they already understand, their learning time shows considerably more efficiency.

Control Of Pace

O'Neal (1977) also cited a number of studies which have investigated pacing. The results are somewhat mixed, generally showing that self-paced learners do no worse than externally-paced learners; and that given appropriate training and some guidance as to adequate progress-against-time, self-paced learners may be considerably more efficient than externally-paced students. There is also some evidence that slow learners do better, given externally slow-paced instruction, rather than being allowed to self-pace the instruction.

Display Control

Our own work involved a series of studies investigating learner-control of presentation displays within a given lesson (NSF Project SED-76-01650). Most of the investigations conducted during this project addressed the following general hypothesis:

> If a learner is provided carefully defined strategy options and is allowed to determine the instructional display s/he wants next, his/her achievement, efficiency, and attitudes toward the instructional situation will be superior to those obtained in a situation in which the next display is prescribed.

The general conclusion which seems warranted by the research conducted is that this hypothesis was not supported in the unqualified way in which it is stated. On the other hand, none of the data collected indicated that allowing the student display-selection on a frame-by-frame basis resulted in a decrement in effectiveness, efficiency, or appeal. The following paragraphs will indicate some of the more specific outcomes which were supported, and some of the findings which have led us to modify the hypothesis and have suggested further research.

Primary Presentation Forms. The research investigations of this project are based upon the assumption that all instructional strategies are composed of certain fundamental types of displays. Most cognitive subject-matter can be represented either by a specific object, event, or symbol, or by representations of such specific occurrences via pictures, diagrams, or other mediated presentations, all called instances; or by a statement of the general case, called a generality. Generalities are statements of definition (for concepts), steps (for procedures), or relationships (for principles) which can be applied to a variety of specific situations.

Each of these two levels of representation (generality and instance) can be presented to the student in two different modes: expository or telling, and inquisitory or asking. Combining generalities and instances with telling and asking results in four primary presentation forms: telling-a-generality, which is usually called "rule"; telling-an-example, which is usually called "example"; asking the student to identify an instance, execute a procedure, or explain a particular event, which is called instance-practice or merely "practice"; and asking the student to remember a generality, which is often not included as a separate function in much of the work which we have done. In addition to the primary presentation forms, there are various forms of elaboration associated with each display type which are called "help" in the work which is reported. These primary presentation forms are what is meant by "clearly-defined strategy options." The TICCIT system, which was used for much of the reported research, makes these strategy options available by providing "rule," "example," "practice," and "help" buttons to the student.

As a preliminary basis for our work on learner-control of strategy options or display-control, it was thought desirable to investigate two hypotheses related to our previous work, which has come to be called component-display theory. These hypotheses are as follows:

1. A segment of instruction should include all three of the primary-presentation forms: rule, example, and practice. (A segment is defined as that instruction necessary to teach a given concept, procedure, or principle.)
2. The primary-presentation forms for a given segment of instruc-

tion (not under learner-control) should be sequenced in some variation of rule-example-practice.

Four of the studies we conducted investigated one or both of these hypotheses (Reigeluth and Merrill, 1977a; Reigeluth and Merrill, 1977b; Spiller, Rogers, and Merrill, 1978; and Coleman and Merrill, 1979). The results of the various studies were not completely consistent; however, the findings tend to show that test performance is higher when all three primary-presentation forms are present. Considered separately, practice tends to make the greatest contribution to test performance. When sequence was significant, performance is superior when a rule-example-practice order is followed. These studies do provide some support for these primary-presentation form hypotheses.

Isolation. In most text presentations the primary-presentation forms are buried in prose, making it difficult for the student to omit a particualr display or to reorder the displays. If the individual displays are physically separated from one another and clearly identified, then the student is better able to exercise learner-control of display-selection. The isolation of primary-presentation forms in text is similar to providing the student wih rule, example, practice, and help buttons on the computer system. Another hypothesis from component-display theory which we felt would be desirable to investigate in conjunction with the proposed research is the following:

3. The primary presentation forms for a given segment should be identified and isolated in such a way that a student can easily locate, skip, or review a given display.

Three studies investigated this hypothesis (Wilcox, McLachlan, and Merrill, 1977; Wilcox, Richards, and Merrill, 1978; and Wilcox, Richards, Hindmarsh, and Merrill, 1978). The results of these studies provide some support for this isolation hypothesis. There was considerable improvement in efficiency when the generalities and instances were isolated, summarized, and identified. In one of the studies the text performance was also significantly increased for the isolation groups.

Number of Displays. Perhaps the fundamental learner control variable is whether a student can determine when enough displays have been studied to optimize test performance. The following hypothesis was investigated as part of this project:

4. Students are capable of selecting the optimum number of instances (examples and practice) they need in order to master the lesson material.

O'Neal (1977) cited several studies which investigated control of amount of practice. (Dean, note 7; Beard, Lorton, Searle and Atkinson 1973; Fisher, Blackwell, Garcia, and Green, note 8; Newkirk, 1973; Slough, Ellis, and Lahey, 1972; Lahey, Crawford, and Hurlock, 1975). In most cases it was demonstrated that students were able to judge when they had practiced enough to reach an acceptable level of mastery of the content being presented.

We conducted five studies which investigated aspects of this hypothesis (Walker, Axtell, Warner, and Merrill, 1977; Walker, Axtell, Fletcher, and Merrill, 1977; Walker and Merrill, 1978; Wilcox, Richards, Christiansen, Rosenvall, and Merrill, 1978; and Strickland, Wilcox, and Merrill, 1978). Students studying logarithms on the TICCIT system were divided into groups of students who could select the number of example-and practice-displays they wished to study, and groups of students who were required to study only a few or many instances. Students who studied only a few instances scored significantly poorer on the test than did students who decided how many instances to study. Students who studied many instances did not score any better than those who selected their own number. A group of students who were required to study as many instances as the mean of the group who selected their own number of instances did as well as the learner-control group. Other combinations and treatments were explored, and the conclusion was confirmed that students can decide how many example-and practice-items they require for mastery. An important ad hoc observation was that there is considerable variance within the learner-control group. Some students choose a considerable number while others select only a few. There is also considerable vairance in the ratio of example-to-practice items - some choose many examples and only a few practice items while others choose only a few examples and many practice items. The data provides considerable support for the number-of-instances hypothesis.

Display Sequence. A second obvious display-control hypothesis is concerned with the order or sequence in which the student studies the various kinds of instructional displays. It seems logical that the student should be able to determine what kind of information s/he needs next. For one student the best display to view next may be the rule display. The following hypothesis was investigated as part of the project:

5. Students who are allowed to select the best display to view next will perform more efficiently and effectively than will students for whom the next display is prescribed by the system or follows in a fixed sequence.

Five studies investigated aspects of this hypothesis (Walker, Axtell, Warner, and Merrill, 1977; Walker, Axtell, Fletcher, and Merrill, 1977; Walker and Merrill, 1978; and Wilcox, Richards, Christiansen, Rosenvall, and Merrill, 1978; and Strickland, Wilcox and Merrill, 1978). Students learning logarithms on TICCIT were used as subjects. One group was allowed to look at rule, example and practice displays in any order they wished; another group saw rule, example and practice displays in this (rule, example, practice) order. There were no group differences. However, there was considerable variance as to sequence in the learner-control group.

In an attempt to determine if certain patterns of displays were associated with good performance while others were associated with poor performance, we conducted a series of regression analyses using a considerable number of display variables. Some of this work is reported in Strickland, Wilcox and Merrill (1978); however, we ran many more such correlations than have been reported. Because none of the results were significant we did not report all of these analyses. Some of the variables used included: total number of displays used, number of examples, number of practice, number of correctly-tried practice, ratio of example-to-practice items, ratio of practice tried-to-practice correct, total time on task, time on rule-frames, time on example-frames, time on practice frames, various time/performance ratios, and others. The only variable we tried which had a significant correlation with performance was an estimate-of-effort which was provided by the students on a post-experiment questionaire.

Do these results mean that there are no general display variables which contribute to performance? We have considerable strategy variance and no correlations. Perhaps students really are trying to adapt the displays to their own needs. Suppose some students are successful in this attempt while others really select displays in a way which is detrimental to their performance. The net result would be no group differences. Maybe students who use an adequate internal adaptive model really do optimize their performance while those who use an inadequate internal adaptive model cause a decrement in their performance. The data we have does not allow us to make this separation of students. We were unable to resolve this dilemma during the duration of the project. Our data do not support the sequence hypothesis.

Help. Primary-presentation forms can be elaborated to include information designed to facilitate the student's comprehension of the subject matter presented in a rule, example or practice display. These elaborations are called rule-help, example-help, and practice-help. The following hypothesis was also investigated as part of the project:

6. Students who have learner control of rule-help, example-help, and practice-help will perform more efficiently than students who have no help or students who are always presented help.

Three studies investigated this hypothesis (Axtell and Merrill, 1978; Axtell, Callahan, Welsh and Merrill, 1978; and Hetzel and Merrill, 1978.) When students are given the choice of selecting help-displays* we found that students who had learner-control over generality-help performed more efficiently and effectively than other groups. However, students who had learner-control over example-and practice-help performed significantly less efficiently and effectively than did other groups. When students do not have practice help available they tend to work practice items over and over until they get them correct. When they can use practice-help they do not work the problems again. Apparently in this situation practice-help gave a false sense of understanding, thus the students in this treatment are less-well prepared for the test. On the other hand, having only generality-help seems to assist the student in preparing for the subsequent practice and test items, thus better preparing students in this group for the test. This suggests that the ability to solve problems utilizing a concept is not equivalent in all cases to a complete understanding of that concept.

Strategy Training. Perhaps one of the problems with the foregoing studies is that students are unfamiliar with the opportunity to make moment-by-moment display-choices during instruction. If students are provided some type of training in how to use learner-control their performance should be better than if they are left on their own. While we did conduct some studies related to this question, we feel that we have only scratched the surface of the potential. The following hypothesis was tested as part of the project.

7. Students who are provided directions in how to use display-control will perform better than will students who do not receive such instruction.

Three studies addressed this hypothesis (McLachlan, Schmidt and Merrill, 1977; Callahan, Richards and Merrill, 1979; and Hetzel and Merrill, 1978). In each case some form of written directions about how to use learner-control was given to the students. None of the studies supported the hypothesis. We are not convinced that the hypothesis is incorrect, only that the directions we used were inadequate to change a life-long habit. Students are not accustomed to having learner-control over individual displays, and tend to settle for some rather simple adaptive method of display selection rather than carefully weighing the need for the next display. A study by Strickland, Fletcher, and Merrill (1978) directed students to maximize learner-control by selecting only as many frames as absolutely necessary, and to examine a given frame for only as long as necessary. Again there were no significant performance differences, although there tended to be some display-selection differences. In all cases it was concluded that the directions themselves may not have been adequate or that they may have been too complex. Hence, as far as the investigators are concerned, this question remains unresolved.

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*A Generality-help display is a display which represents the generality from a previously-presented generality-display, but presents it in a new form or through instances which illustrate or exemplify it.

An example-help display is a display which utilizes attention-focusing devices to show how the instance relates to the generality.

A practice-help display is a display which uses attention-focusing devices to show how a problem was worked.

We did begin to investigate one other aspect of strategy-training which seemed to have more promise. the following hypothesis was also investigated as part of the project:

8. Students who are provided directions for conscious cognitive processing of the information presented will perform better than will students who are left to their own internal processing strategies.

Two studies investigated this hypothesis in part (Wilcox, Richards, Hindmarsh and Merrill, 1978; and Callahan and Merrill, 1979). In both cases students were directed in specific ways to think about the material they were being presented. In both studies those students who received directions about how to process the information scored higher on the posttest than did students who did not receive this direction. The Callahan and Merrill study also demonstrated that different directions are appropriate for different outcome measures. We feel that this work has important implications for the future, and may be the most important finding of the entire project.

Rewards. We have already indicated that one of the problems in learner-control research is student motivation. If a student is poorly motivated s/he may use the learner control available to get out of the experimental situation regardless of his/her performance. On the other hand, other conscientious students look at every available display in an attempt to do well and not "ruin the experiment," and so omit no displays. This problem was solved to some extent by selecting samples of students from ongoing classes in which the subject-matter of the experiment in which they were involved was part of their class-work. We also studied the problem directly to a limited extent. The following hypothesis was addressed by this project:

9. Students who are provided some external incentive will use learner-control in order to be more efficient than will students not provided with such an incentive.

Only one study addressed this hypothesis directly (Callahan, Richards, and Merrill, 1979). The extrinsic reward was a free ticket to a downtown movie (worth $4.00). Students were directed to be as efficient as possible by selecting as few displays and taking as little time per display as possible while still scoring at the 80% level. The directions were not sufficient to produce differences in performance which could be attributed to the extrinsic reward. This one study failed to confirm the hypothesis. However, the investigators feel that if the reward were of more value, the directions more explicit and the contingencies more clear-cut, that there would be differences introduced as a result of motivational incentives. More work needs to be done in this area.

Aptitude-Treatment Interactions. While the principal investigator has suggested that learner-control may be an alternative to aptitude-treatment interactions (Merrill, 1975) it is nevertheless possible that the ability to profit from the use of learner-control may be itself a treatment that interacts with student abilities. Two studies investigated ATI questions (Wilcox, Wilson, Richards and Merrill, 1978; and Norton, Wilcox, Fletcher and Merrill, 1978). The Wilcox, et al., (1978) study measured various aptitudes which were thought to be candidates for enabling a student to profit from the use of learner control over display-selection. The pilot study showed an interaction with locus-of-control, but a more elaborate study failed to replicate this finding. None of the aptitudes measured provided the ATI's we expected. One of the problems with this study was the small sample size. ATI correlational studies require a much larger sample size than do typical experimental studies in which interactions are not predicted.

The second study (Norton, et al, 1978) examined visual and verbal ability. Students were allowed to determine which, a visual or a verbal presentation of the subject-matter material, they wished to see. The expectation was that those who were visual would prefer visual material and do better. The hypothesis was not supported. Wilcox (1979) reviewed 14 studies by other investigators which showed that certain abilities tended to interact with the student's ability to use learner-control. Hence this issue is also not resolved but requires more investigation.

NEW DIRECTIONS

As a result of work on this project, we have been led to think about learner-control in some new ways. First, we would suggest that there are several kinds of learner-control: content-control, display-control, and control of conscious-cognitive processing. Second, we postulate that every student has some type of internal "how to learn" model which directs his/her use of each of these types of control. In view of this conceptualization we believe that every instructional situation has some amount of learner-control involved. In our opinion, helping students to develop internal adaptive models which direct their use of appropriate internal processsing is the most promising area for further exploration.

The model of internal and external learner-control which is presented enables us to conceptualize meaningful research in several directions. One such direction is a way to compare individualized instructional systems more adequately than has been possible in the past. as described above, it makes possible the explication of conscious-cognitive processing and its role in adaptive instruction. It also clearly separates internal from external adaptive models of instruction and clarifies the interaction between the two.

In our opinion the challenge for the future is not whether or not we should arrange instructional situations to facilitate display or content selection, but rather that we should seek to identify the nature of the learner-control in every instructional situation. We need to know more about the types of conscious-cognitive control which may be appropriate for different kinds of outcomes and for different kinds of displays. We need to investigate ways to help students to learn to use more appropriate processing in these situations. And we need to explore the possibility that the adaptive model and conscious-cognitive processing which is appropriate for one student may be different from that which is appropriate for another student. In our opinion, the challenge is not to discover whether or not learner-control, but rather to help every student to maximize the use of the learner-control which is already available.

SUMMARY

A number of levels of learner-control have been defined in this paper. Content-control exists when a student can select and sequence segments, lessons, or units of instruction within a course. Content-control sometimes appears in a form which permits the student to omit content components which the student feels s/he already knows. Content-control is limited by the delivery system but it is always possible, even in conventional situations which involve textbooks and other forms of individual study.

Display (strategy) control exists when a student can select and sequence individual presentation displays--rule, example, practice--or elaborations of such displays--rule-help, example-help, practice-help, and feedback. Such control is facilitated by systems especially created for isolating and identifying these individual presentation forms. Display-control is not limited to computer-based systems, but can easily be implemented through textbooks, workbooks, and other individualized media by isolating and identifying the individual presentation-displays and by encouraging students to select only those displays which they feel they need. Students can also learn to exercise display control in conventional materials such as texts and workbooks, given a self-paced environment and appropriate instructions.

Conscious-cognitive control always exists in every instructional situation. The student must always choose what to do to encode the material presented. There is little data as to the variety or effectiveness of the techniques used by students to process the information they are presented. A number of questions suggest themselves: Through the choice of an appropriate processing strategy, can a student compensate for a less-than-adequate display presentation? Do students use the most effective processing strategies available? Can they be taught more effective processing?

Every instructional situation always involves for each learner an adaptive individualized learner-controlled model of learning. In externally-adaptive situations this model guides all three of the other levels of learner-control: content-selection, display-selection, and cognitive-strategy-selection. In situations where content and displays are prescribed, the learner's idiosyncratic model still provides rules for adapting the instruction for the learner via the appropriate use of processing strategies. A number of questions suggest themselves: Do students typically have well-developed conscious adaptive models, or are they somewhat haphazard, inconsistent, and frequently maladaptive? Can students be taught more effective adaptive models which will increase their performance in a variety of learning situations? Can students learn to be systematic in the application of such models? Are such models idiosyncratic to the individual or do general models exist which are facilitative to a variety of individual students?

Finally, to investigate learner-control vs no learner-control is not a sufficiently constrained question. One must at least specify the level of control one is investigating. All instruction involves some learner-control; the challenge is not whether or not learner-control should be made available, but rather how to maximize the student's ability to use the learner-control available. Given a system which allows content-selection and display-selection, the important question is how to help the student maximize his/her choices and match them with appropriate cognitive processing activities in order to maximize performance. Given a more restrictive instructional environment which prescribes content sequence and display-selection for the student, the important question is how to help the student select those cognitive processing activities which will maximize performance in this type of situation. Ultimately, the student who has the most choices available will be best able to maximize the effectiveness and efficiency of a given learning situation.

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FOOTNOTES

[1] TICCIT (Time-shared, Interactive, Computer-Controlled, Information Television) was developed under a grant from the National Science Foundation (contract number NSF-C729) as a joint project between several institutions including MITRE Corporation, University of Texas, Brigham Young University, Northern Virginia Community College, and Phoenix Community College. The system and its use of learner control has been described in other publications and will not be described as part of this paper. (See Merrill, Schneider, and Fletcher, in press; Merrill, 1980).

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Chapter 18

Student Development: The Next Logical Focus

James D. Hand

A new branch of educational development has recently appeared, to supplement F.D., O.D., and I.D.; it is student development (S.D.). Student development can be considered to be the development of, or work with, the student, much as F.D. is the development of, or work with, the faculty member. What is the nature of this concept, how is it implemented, and how does it relate to the other three functions? The present paper defines and describes this new area, giving both a theoretical discussion of S.D. and describing its implementation in several settings.

Instructional development, as it emerged in the late 1960s and early 1970s, focused upon faculty and their teaching methods, administrative budgetary considerations impacting upon instruction, and to a very minute degree upon the types of students served. Information regarding students was limited to a few main categories: prerequisite learning, attitudes toward instruction, learning styles, and socioeconomic background. Armed with this information most schools could do little because of their limited instructional resources and the limited scope of teaching methods available to most teachers.

Researchers attempted to identify traits and aptitudes of groups of students so that instructional strategies and methods could be employed cost effectively in small-group and large-group instruction. As Cronbach (1975) pointed out, these studies have not proven particularly fruitful. In no research have educators found the panacea, the one true light by which all students may learn.

This chapter presents one plan for progress while we await an educational messiah. Instructional developers have busied themselves in faculty-and organizational development in recent years. Now it is time for student development to take its place along side I.D., F.D., and O.D.

The purposes of this chapter are to:

1. Describe what student development is;
2. Discuss why S.D. is needed;
3. Indicate some of the interrelationships and complementary aspect of S.D. to I.D., F.D., and O.D.;
4. Describe how student development can be carried out; and
5. Where it is being instituted.

WHAT IS STUDENT DEVELOPMENT?

For the purposes of this discussion, student development is considered to be the process by which the learner is educated to become a sophisticated consumer of education. The process facilitates both educational and personal growth. To this end, student development aims at increasing skills and establishing positive attitudes in the following areas:

- Evaluating both formal and informal instruction;

ES256

- Setting educational and life goals and objectives;
- Educational and life-oriented research and data gathering;
- Fundamentals of budgeting and policy making (personal and institutional);
- Self-education and motivation toward lifelong learning;
- Development of the student's learning capabilities (both skills and attitudes) to their maximum potential.

This description differs significantly from those evolving within the context of 1) offices of deans of students, 2) counseling centers, 3) learning skills centers, student imporvement laboratories, and educational units. The first of these working definitions, which is used by many offices of deans of students is most readily found in the "Bulletin Board" section of The Chronicle of Higher Education. The job description for student development personnel include:

- "coordination of student judicial and disciplinary systems;"
- "counseling and advising students in groups;"
- "...must have Master's degree in student personnel, counseling or related field; a Ph.D. preferred";
- "...must also possess five years of relevant experience in residence halls and/or student services." (Chronicle of Higher Education, July 23, 1980).

The description used at counseling centers, at such schools as Cornell University and Kansas State University, encompasses student course selection, career choice and personal problem-solving activities. One job advertisement included the following:

- "...be responsible for working with students and faculty individually and in small groups in an attempt to counter and design behavior to improve effective learning and teaching."
- "...be responsible for the development and maintaining of records pertaining to study skills, and career preparation programs as well as academic, personal, and social counseling and peer tutoring." (Chronicle of Higher Education, July 14, 1980.)

Learning skills centers, student improvement laboratories, and educational development units see student development as a combination of areas including:

- increasing reading rate and comprehension;
- math skills;
- study skills;
- listening skills;
- visual skills;
- tutorial assistance.

A multitude of secondary schools and institutions of higher learning use this description.

A few institutions have gone beyond these limited descriptions in an attempt to develop the total person. Notable among these are The University of Arkansas-Fayetteville, and The University of Vermont. These two schools favor a working definition of student development similar to that used in this chapter.

WHY IS STUDENT DEVELOPMENT NEEDED?

What happens when we change the faculty, the instruction, and the environment yet do nothing to change the studnet's capability to cope with learning? We have spent much time and effort to make instruction fit the student, with mixed results. On the other hand we have spent precious little of our resources in educating the student to cope with whatever form of instruction is presented. Channeling the learner only down the path by which he learns most readily keeps the student from expanding his repertoire of capabilities just as surely as presenting instruction in the format most preferred by the instructor.

The prevailing philosophy among instructional development professionals holds that the primary beneficiary of our efforts should be the students. That is the reason we became involved in faculty development and, later, organizational development. To impact the entire educational system we must impact all pertinent components of the system including the student. The student is an integral part of the educational process, for without learners we cannot have education.

Philosophically, instructional developers have advocated the inclusion of students in the decision-making processes involving curriculum development, goals and objectives determination, policy making, and even budgeting. Yet students for the most part are not trained observers or workers in any of these areas. If we wish and expect students to be meaningfully involved, they must acquire at least a layman's level of knowledge and skills related to educational decision-making. One attempt, which seems to remain unreplicated, was a trial instructional development project at Syracuse University in the early 1970's (Richardson, et al., 1973). A group of Honors students, in conjunction with graduate interns in I.D., undertook a course revision project in History 255 (American History Through the Civil War). The Honors history students served as the content specialists, two graduate interns served as the instructional developers, and the role of evaluator was taken by an intern in evaluation. Faculty members and staff from the Center of Instructional Development served as advisors, but the primary responsibility for the success of the project fell on the group of undergraduate and graduate students. The conclusions of this pilot project were:

- "Student input is valuable and often essential."
- "It will take longer to develop a course using students as active participants."
- "If students are used, they must be carefully guided so that they know what is expected of them at each stage."
- "The students must be helped to become effective as an informal group so they can discuss, disagree, express their feelings, compromise, and decide without being overly defensive."
- "This project was an effective learning experience for the students."
- "Time and tasks have to be carefully organized for maximum efficiency."
- "The experience of administering such a project is excellent training for an intern in instructional development."

The necessity of beginning student development efforts is also reflected in public demands for accountability, fiscal restraint, and consumer protection, all of which have been heightened by the increasing costs of inflation and decreasing scores on nationally standardized tests. The issue goes beyond "Why can't Johnny read?" to "Why won't Johnny read?" It goes beyond keeping the student active in the classroom, to preparing the person to be an active participant in the world for a lifetime. It goes beyond preparing the student to pass the next test, to preparing the student to pass life.

Most Americans spend from 10 to 18 years of their lives in formal learning environments. During this time our major efforts as instructional developers are intended to benefit those who attend school. We work hard to prepare the organization, the faculty, and the learning setting so that students will derive the optimal benefits from schooling. From the student's view, more often than not, school is a way station between childhood and the working world. And more often than not schools refrain from teaching the student how to cope, how to survive, or how to advance once the formal schooling has ended.

A common phrase heard by this author is that "students come and students go, but the faculty stay forever." This is a view of the world from an instructional perspective. In the time-space continuum of life, people called students meet people called teachers in a place called school. Most people are called students for only a brief time in their life; yet in today's world one must be a learner from birth until retirement, at least. The hope is that retirees will also remain active learners.

INTERRELATIONSHIPS AND COMPLEMENTARY ASPECTS OF STUDENT DEVELOPMENT TO I.D., F.D., AND O.D.

Student development complements the efforts of instructional, faculty, and organizational development. By preparing students to organize their lives, evaluate their successes and failures, seek and critique new information on their own, and generally separate the flowers from the fertilizer, students become independent, self-reliant individuals. By educating students to become sophisticated consumers of education we can prepare them for an active, constructive role within the educational process. Where students are involved in the development processes, either as participants or recipients, student development efforts can impact heavily and appropriately.

As an example of the interlocking relationship of student development and faculty development let us look at the course and faculty assessment programs carried out at many schools. There has been a recent tendency for institutions to conduct formal assessments and for individual interested faculty members to conduct informal surveys regarding the worth of a course and/or the expertise of the teacher. Perhaps the most powerful confounding variable in this process is the student. While most learners know what they like and don't like about a course or teacher, very few can answer each of these questions:

1. What is it that I am supposed to be learning?
2. What constitutes effective teaching?
3. Can what I am learning be applied beyond this classroom?
4. How am I to be evaluated? (How are "grades" determined?)
5. By what methods do I learn most effectively and efficiently? Are those methods employed in this course or by this teacher?
6. Is the instruction pertinent to my educational and life goals?
7. What specific kinds of comments (on this survey) would be of the greatest benefit to the instructor or administration for the purpose of course or faculty improvement?

When students are taught how to evaluate their instruction and how to constructively respond to course and faculty evaluations, the validity of those surveys will probably increase. This gives the faculty, administration, and instructional developers a more solid data base from which decisions can be made regarding faculty development.

The relationship between student development and organizational development is, perhaps, the least obvious. At many schools students are included on committees involved with admissions criteria and procedures, budgetary considerations, capital improvements, assessment of courses, curriculum improvement, and selection of faculty and administrators. When placed on such committees students are at a distinct disadvantage, faced with experienced and knowledgeable faculty and administrators whose tenure at the school may be five to 20 times that of the students. The students have an immediate perspective of the institution; faculty and administration have a more longitudinal perspective. The most importatnt distinction between students and faculty/administration, however, are 1) power and 2) knowledge of the system; the who, what, where, when, why, and how of the system's inner workings.

As a group, students will probably never acquire the level of power held by faculty and administrators except by court judgments, such as Olsoon v. Board of Higher Education of the City of New York, 412 N.Y.S. 2nd 615 (1979). In such cases instructional responsibility for fair practice and adherence to policy may be defined in favor of the students. Be that as it may, these "junior partners" in the organizational development process can be taught the basics of committee work, budgeting, curriculum evaluation and improvement, personnel selection, contract specification, and other intellectual skills necessary for meaningful involvement in decision making. These skills can then be used by the students in their personal and professional lives. Many schools advertising in the Chronicle of Higher Education hire personnel to advise and train officers in student government and Hellenic organizations. Such services also could be provided to students serving on institutional committees.

The most obvious relationships are those combining student development with instructional development. Here the focus of both is on the learners. Instructional development has faced budgetary constraints in the past, and there is little hope that the near future will bring relief. This means that we will continue to attempt to formulate instruction which reaches the most students with the least expenditure of available resources. It is still less expensive to teach learners to cope with the instruction than to provide multiple formats. Augmenting the educational cognitive style of a student through structured practice and experiences will increase the person's skills for learning from a variety of instructional formats (Bass and Hand, 1978).

Students are often called upon by I.D. teams to assist in such tasks as problem definition (this author prefers the phrase "definition of potential," aimed at the positive rather than negative), goal specification, field testing of instructional packages, and evaluation of the teaching/learning process. Braden and Terrell (1978) suggest that students could be of much more use in the I.D. process, in approaching faculty with course revision ideas, in working with faculty who might feel threatened by instructional developers, and in active participation on small scale projects. Once again, to provide meaningful input for the I.D. team the students should be taught something about each of these tasks and how the tasks are evaluated.

HOW CAN STUDENT DEVELOPMENT BE CARRIED OUT?

Student development is, as the reader has seen, an educational and evaluative process. Therefore, student development can be carried out exactly as any other instructional program, i.e., through a multitutde of methods and strategies. For each component of S.D. there is content to be learned, processes to be mastered, and intellectual skills to be acquired. Student development must be lived, however; it cannot occur vicariously. The student must be actively involved in the task of budgeting, for instance, to fully comprehend how budgetary considerations interrelate and to grasp the very personal impacts of budgetary policy upon personnel and programs.

In brief, the student must learn something before it can be applied. And it must be applied before learning is complete. Student development, then, is accomplished through these two sets of learning experiences.

WHERE IS STUDENT DEVELOPMENT BEING IMPLEMENTED?

Student development as discussed in this paper has been instituted as an organized, integrated set of services in a relatively small number of schools. At the University of Vermont (Burlington) the program is called the Living and Learning Center (John Engroff, Jr., Director). The center is housed in a six-building complex built specifically as a living/learning facility. Students and faculty live, study, and socialize in academic clusters, and outside those clusters with the rest of the university. Students propose academic study programs to be housed in the L.L.C., formulate budget, set learning objectives, devise instructional experiences, and establish formative evaluation plans for their own programs. Faculty may also submit proposals. The Director and Assistant Director/Program Coordinator assist the students and faculty in developing and clarifying program ideas and learning objectives, interpreting proposal guidelines, identifying resources and program evaluators, and developing the program's budget. All these steps are outlined and discussed in a brochure (Living/Learning Center, 1979) available from the Center. Of 45 programs housed in the L.L.C. during 1979, 30 were proposed by the students. Six hundred people living academics, sharing perceptions and knowledge, guiding their own education, evaluating their lives and their instruction; this is the thrust of the Living and Learning Center at the University of Vermont.

The Student Development Center at the University of Arkansas-Fayetteville is a drop-in center rather than a live-in facility. The S.D.C. is composed of three units: Learning Resources, Special Services, and Counseling. special Services is funded by federal monies, and provides remedial and developmental assistance to disadvantaged students. This unit was established for students with overall low scores and low grades, and for students who may be "educationally and economically deprived."

The Learning Resources Unit allows students to improve basic academic skills required to achieve their educational goals. Clients of the unit include those on academic probation, students with English as a second language, professional school students with academic support needs, or students needing individual attention in the areas of reading, mathematics, or study skills. Faculty tutors work with students in both Learning Resources and Special Services. In addition, one-to-one and small group educational consultation and mini-workshops on selected topics are provided by both these units.

The Counseling Unit seeks to improve the student's skills required for personal, social, and cultural growth and development. This unit was organized specifically to serve students who desire personal development experiences or counseling as well as life-planning counseling. Graduate assistants in counselor education and psychology are employed and they are available to students without appointments and at no cost.

Funding of the Student Development Center at the University of Arkansas-Fayetteville has come from three sources. Seed money in the amount of $10,000 came from the University of Arkansas Foundation, with an equal amount reserved for each campus of the U. of A. system. Expenditure of this money was restricted to the purchase of hardware and software intended for use in learning skills centers. Additional funds were secured from a federal "Title" grant and from room rents which cover custodial services, physical plant maintenance, hall advisors, and domitory assistants.

LONG-TERM STUDENT DEVELOPMENT

The University of Arkansas Medical Sciences Campus (UAMSC) has planned a long range student development project which will eventually link the health sciences professional programs with students, educators, and counselors at all levels from junior high school students to those already enrolled in the health science professional programs. This effort is being piggybacked on existing programs as much as possible to reduce costs. For instance, UAMSC currently has a federal grant supporting efforts to increase the number of minority health science professionals. As part of that effort the Office of Minority Student Affairs (OMSA) visits most of the four-year and two-year colleges and universities in Arkansas, speaking with students, faculty, and counselors about opportunities for minorities in medicine, pharmacy, nursing, and related health professions. OMSA also sponsors a summer enrichment program for entering minority medical and pharmacy students, and provides continuing counseling assistance for all minority students enrolled in medicine, pharmacy, nursing, and related health professions. The proposed student development effort will complement and expand these services to all students who wish to enroll in any program at UAMSC.

Phase one of this enterprise entailed the establishment of a Pre-Medical Academic Consortium (PMAC) linking UAMSC with each of Arkansas' four-year institutions from which the College of Medicine draws its applicant pool. Phases two and three will include the addition of high schools and junior high schools within the Consortium.

The purposes of the PMAC, established in August 1980, include the following:

1. Screen interested students for specific content and learning skills and weaknesses.
2. Work with learning skills specialists, counselors, and faculty on Consortium campuses to provide programs for increasing each student's skills and knowledge.
3. Work with faculty on each campus to provide specific content assistance for students if tutorial programs do not currently exist.
4. Offer a communication link between UAMSC College of Medicine, Consortium faculty members and pre-med committee members, providing a formal link between pre-med academic programs and UAMSC.
5. sponsor summer courses offered at the end of the undergraduate freshman and sophomore years to upgrade content knowledge, provide exposure of UAMSC to undergraduates, provide learning skills assistance if desired, and to provide career and life counseling to interested students.
6. Establish a network of learning specialists who will work with students from junior high school, through high school and undergraduate school, into medical school (if necessary) to continuously increase the student's potential for success in medical school and as a physician.
7. Develop and distribute a PMAC Newsletter publicizing educational advances, curriculum changes, innovative approaches to teaching, funds and grants secured, and other items of interest.

Efforts during the initial year of the Pre-Medical Academic Consortium focused on four inexpensive activities: the newsletter, campus visitations, diagnostic screening, and a set of guidelines as to the types of information and the format for letters of recommendation from premed committees to be included in the applicant's admission file.

Efforts during the second year focused upon adding four activities. An annual meeting of selected faculty form each undergraduate school and UAMSC College of Medicine was held to discuss methods for "bridging the gap" between pre-medical and medical studies. Summer work experiences for pre-medical students were offered in laboratories, hospitals, clinics, and physician's offices. A "mock MCAT" (Medical College Admissions Test) was offered, to identify junior students' content weaknesses so that they could focus their review studies for the actual admissions examination. And finally, learning skills specialists from PMAC campuses (members of the Arkansas Consortium on developmental Education) were involved in diagnosing and strengthening of students' reading skills, visual perception/discrimination skills, deductive reasoning, and oral communication skills.

During the 1980-81 year of PMAC a Student Development Center was established on the UAMS campus within the Office of Educational Development. Services provided were related specifically to the aims of students development as stated in this paper. Under the auspices of the Office of Educational Development (a campus-wide service organization offering I.D., F.D., and O.D. in addition to student development) staff worked with students, faculty, administrators, and other educational service units in an attempt to impact each and every component of the educational process at UAMSC. Through the establishment of pre-professional academic consortia the impact on students wishing a career in the health sciences should be extended, eventually, from junior high or high school throughout their professional training.

As indicated previously the Student Development Center will piggyback on existing funds, personnel, space, material, and furniture. Additional sources of funding will be sought from state allocations, private foundation grants and possible federal funds. As examples of piggybacking the following are currently available on the UAMS campus, and can be tapped by the Student Development Center:

1. Eight private study/conference rooms and over 100 learning carrels in the library;
2. Wet carrels with slidetape, videotape, filmstrip, 8mm motion picture and computer terminal capabilities (all with software files) in the AV Library, located in the main Library;
3. Faculty tutor programs;
4. Graduate assistant and upperclassmen tutor programs;
5. Committees of faculty and students, the purposes of which are to recruit and retain students within UAMSC programs;
6. A grant to recruit and retain minority health professions students in Medicine and pharmacy;
7. Liaison committees working between UAMSC and several four year "feeder colleges," including UAMSC faculty, Admissions Director, Director of Minority Student Affairs, and other administrators;
8. In-state automobile travel funds from state and federal monies;
9. Study guide materials developed by various departments and the Office of Educational Development;
10. Counselors within the Psychiatry Department.

In addition to on-campus resources, UAMSC has an agreement with the Learning Development Center at the University of Arkansas-Little Rock, within two miles of UAMSC. UA-Little Rock has extensive diagnostic materials and sophisticated equipment, and a staff of learning specialists available to UAMSC students all for a fee of $50 per year. This charge is currently paid from a special UAMSC fund for medical students who need the sophisticated assistance available at UA-Little Rock. Students in the College of Health-Related Professions are expected to pay the fee from personal funds.

SUMMARY

Student development programs are on the rise in this country. Most of the programs focus upon improvement of academic skills, course selections, career choice, and personal counseling. The existing programs work with students from the time of admission through graduation to increase their potential for success on that campus alone. The author could not identify any current program which extended services to students several years prior to admissions or after graduation. Neither has this author found a student development program, integrated with instructional development, faculty development, or organizational development, which attempts to meet the broad definition of services listed earlier in this paper.

It is time for student development (S.D.) to take its complementary place alongside I.D., F.D., and O.D. For if we attempt to change instruction, faculty members, and the educational organization without paying heed to the students we will have ignored an integral part of the educational process. Beyond that we must come to view the student as a person who comes to school as preparation for life as well as for academic/intellectual fulfillment. Part of our job as educators must be to prepare the students to face life as active participants; independent, dedicated to continuing their education throughout life, and educated to be sophisticated consumers of education.

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Chapter 19

Frame Games and Game Chains: A Technology for Interactive Teaching/Learning

Harold D. Stolovitch

Instructional development activities result in many forms of instruction. Some of these varied forms show great similarity, yet IDers are constantly "reinventing" these very similar forms. This chapter presents two basic forms of interactive teaching/learning which individually and in combination can be used by developers at many levels to help learners obtain objectives which require communication, group decision making, team planning, or simple interactive skills—and "reinvention" is not required.

INTRODUCTION

This chapter presents two significant gaming concepts, one old and one new, and attempts to demonstrate how through their application interactive teaching/learning situations can be structured to help attain prespecified objectives. major concerns of the chapter are, first, to maximize learner inputs and activity in the instructional process, and second, to place the responsibility for learning squarely on learners' shoulders. Interaction in this context, therefore, is viewed as something which should primarily occur among learners. The instructor, teacher or trainer has the prime responsibility for designing the interactive learning situation and managing the learning process. Occasionally s/he or a subject-matter expert takes a leading role in the interaction itself, but only as a natural and integral part of the overall design.

This chapter begins with a definition of "frame-games," a concept already well-documented in the game literature. (For a more in-depth explanation, definition and examples of frame-games see Horn, 1974; Stolovitch, 1978; Thiagarajan and Stolovitch, 1979; Thiagarajan and Stolovitch, 1978). It then introduces a newer concept, game-chains, which has appeared in related forms elsewhaere, but is a relatively innovative procedure in terms of game design. Examples of both frame-games and game-chains are provided, along with suggestions as to how these can be fit together in order to build highly effective interactive teaching/learning sessions.

FRAME GAMES

In the instructional setting, Stolovitch and Thiagarajan (1980) define the frame-game as follows:

> ... a design that provides a framework for creating contrived learning activities involving conflict, a set of rules for player moves, and termination criteria so that winners may be determined. This framework is easily adaptable to a wide variety of objectives and content.

All games can be broken down into two major components: structure and content. Any game which exists, therefore, initially possesses frame-game potential. The game must be carefully

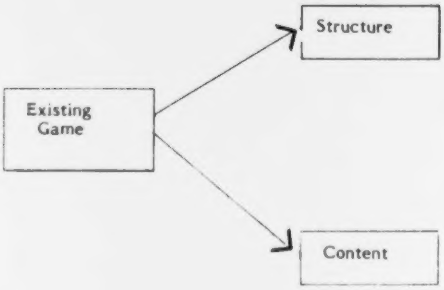

Figure 19-1.

analyzed to dissociate structure from content (Figure 19-1).

In gaming terms, we say that we "unload" the game of its content in order to expose its underlying structure. This structure, clearly defined and analyzed, becomes a "frame." The game or instructional designer then introduces a new content together with its pre-specified objectives, and "loads" it onto the exposed frame, thus creating a new, and for the targeted learner-group, instructionally-relevant game (see Figure 19-2).

Usually, some adjustment to the frame must be made in order to achieve a completely comfortable fit between content and frame. The degree of flexibility and adaptability of the underlying structure makes a game more or less suitable as a frame-game.

The process of adapting new games from old frames is one which many educators and trainers frequently use. Essentially, the frame-game approach to game design is based upon the principle, "if it works well in one setting then it should work in another, if suitably altered." Success with this approach has been documented (e.g., Tymitz, 1979). The author of this chapter has assisted hundreds of teachers and trainers in designing games to meet their own special instructional needs. With few exceptions, most of the games so produced have been successful with the intended learners.

At this point, perhaps, an example of the frame-game adaptation process using a simple, well-known game might best demonstrate how frame-games can rapidly generate new instructional games. Below is an example drawn from Stolovitch and Thiagarajan (1980). It describes the popular game of CONCENTRATION and shows how the structure can be exposed to reveal the underlying frame. It then illustrates how the frame can be loaded with (and adjusted to) two new and different sets of content, thus generating two new games.

CONCENTRATION

CONCENTRATION is a popular card game with many variations. Basically, the ordinary 52-playing-card deck plus two jokers is shuffled and

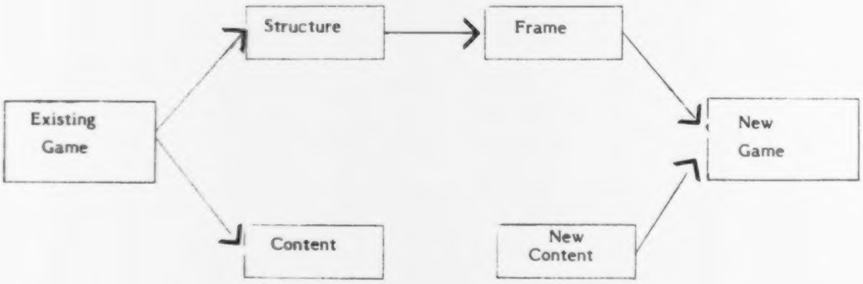

Figure 19-2.

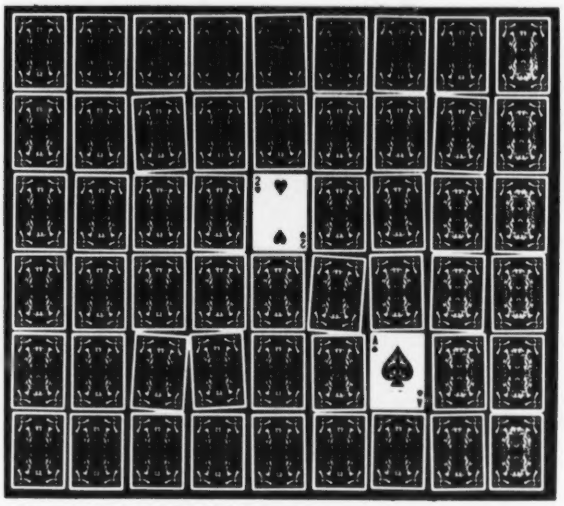

Figure 19-3. CONCENTRATION

then laid out, face down, in rows. Players take turns turning over cards two at a time, as illustrated in Figure 19-3. If they match--i.e., have the same value--the player turning the cards over keeps them and gets another turn. Players concentrate on the locations of different cards, since all unmatched cards are turned face down again. The game ends when all cards have been collected. The winner is the player who collects the most cards.

Removing the content form the game, we see that the concentration frame operates as follows:

1. Stimulus elements are randomly laid out with the faces hidden.
2. Players reveal two elements at a time.
3. Elements which form a pair are retained by the player. Elements which do not form a pair are turned face down.
4. Players take turns, unless a pair is revealed. A player uncovering a pair receives an extra turn.
5. Pairs are removed until no more elements remain.
6. Player with the highest number of pairs wins.

The CONCENTRATION frame is graphically depicted in Figure 19-4.

Here are two adaptations (new games) based upon the CONCENTRATION Frame.

Adaptation 1. WEATHER WATCH

Players: Amateur sailors taking a course on weather
Objective: Discriminate among various cloud forms.

Materials:

Forty cards with uniform backs containing photographs of various cloud forms. There are four different photographs of each of the following ten cloud forms: cirrus, cirro-cumulus, cirro-stratus, altocumulus, alto-stratus, nimbo-stratus, strato-cumulus, stratus, cumulus, cumulo-nimbus.

Number of players: Two to five
Approximate time requirement: 15 to 20 minutes
Play of the game:

1. The game leader shuffles all the cards and then places them face down in rows.
2. The first player selects two cards and turns them face up so that all players can see the cloud photographs on them.
3. If the two cards match, the player names the cloud form. The game leader verifies whether or not there is a match and whether the name is correct.
4. If correct, the player retains the pair and gets another turn. If incorrect (either through mismatching or misnaming), the game leader says "no" and play passes to the next player. If there is no match, play also passes on.
5. The game continues until all pairs are removed. The player with the most cards wins.

Adaptation 2. NUMBER VALUES

Players: Pre-school/primary school children
Objective: Associate standard arabic numeral with its value.
Materials:

A standard set of dominoes (28). Thirteen flashcards each containing a number from 0 to 12.

Number of players: Two to ten
Approximate time requirement: 15 to 20 minutes
Play of the game:

1. One child lays out all 28 dominoes in random fashion face down. Another child shuffles the 13 cards and also lays them out with the numbers hidden.
2. Players turn over one domino and one card at a time. If the number of dots on the face of the domino equals the number on the card, the player keeps the domino, but turns the card back over. If there is no match, both the card and the domino are turned back over. Players get an extra chance each time they make a match.
3. The game continues until all dominoes are removed from the table. The player with the highest number of dominoes wins the game.

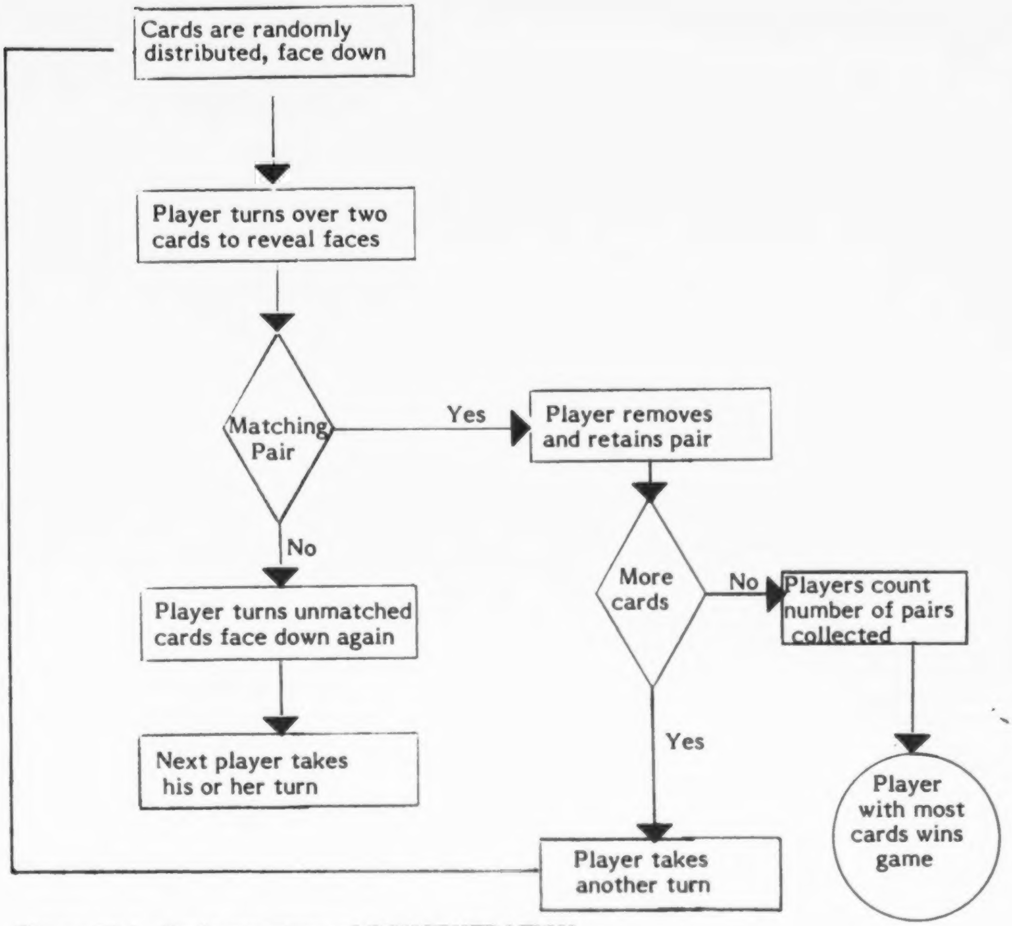
Cards are randomly distributed, face down
Player turns over two cards to reveal faces
Matching Pair
Yes
No
Player removes and retains pair
More cards
No
Yes
Players count number of pairs collected
Player turns unmatched cards face down again
Next player takes his or her turn
Player with most cards wins game
Player takes another turn

Figure 19-4. Basic structure of CONCENTRATION.

Thus far, we have examined the basic concept of frame games and have seen how the process may be applied to a simple existing game. Thiagarajan, in the late 1960s and early 1970s, began developing a series of game structures or frame games which he labelled as GAMEgames. These GAMEgames in and for themselves have never possessed a content. They have been designed specifically as frame games onto which an extremely broad variety of content can be loaded. They have been used to generate interactive teaching/learning activities on topics ranging from abortion and behavioral objectives to yoga and zoning laws. Below is an example of one of the GAMEgames, drawn from Stolovitch and Thiagarajan (1980).

NEEDS ANALYSIS GAME

This frame game is appropriate for situations in which a prioritized list of some kind is required. This game receives inputs from members of a group, and through a scoring system which rewards consensus, produces a prioritized list of needs, criteria, products, people, principles, action, steps, etc.

The basic structure of the game is shown in Figure 19-3 and is described as follows:

1. The group is divided into teams of four to six players each.
2. Each team prepares a list of policies, positions, needs (or whatever), which is appropriate to the topic.

3. Once the teams have prepared their lists, the game leader elicits one item from each team and writes it on a chalkboard or flip-chart. this process is continued until a dozen items have been placed on the board or chart.
4. Each team secretly selects the most acceptable item from the list on the board.
5. Team selections are exposed. Teams score a point for every other team selecting the selecting the same item.
6. The item which receives the most votes is ranked first and crossed off the list.
7. The game continues until a pre-specified number of items is selected.

Here, although very extended, is a description of one of the adaptations designed using the basic NEEDS ANALYSIS GAME frame.

Adaptation 1. THE POLICY COUNCIL GAME

What would it feel like to be an important member of a policy council determining matters of starvation and food, birth and death, and a host of other critical factors? Every day, different councils debate food, population, energy, and agricultural policies all over the world, from local meetings of village elders somewhere in rural Chad to large assemblies of sophisticated diplomats in the United Nations. These key decision-makers have to come up with policies in the best interests of the most people.

In the following simulation game, each team represents a member of a policy council trying to reach consensus on vital issues related to the world food problem. During the play of the game, in trying to reconcile what you feel is the best policy with what others are willing to accept, you experience some of the frustration felt by members of such councils in the real world. Your team scores high if it comes up with widely accepted solutions and also if it accepts stronger solutions from other teams.

Players: Adults interested in the world food problem

Objective: Identify five acceptable policies which can help alleviate the world food problem.

Number of players: 3 to 30. If there are five or fewer, each plays individually. With more than five, players are divided into three to six teams of approximately equal numbers.

Approximate time requirement: One to two hours.

Materials:

Paper and pencil for each team. Chalkboard or a large flip-chart for writing down the common list of policies.

Play of the game:

The following are brief descriptions of the steps in the game. Each step is illustrated by the outcomes from an actual game played by a group of adults. The steps in the game are printed in regular type while the sample game segments are indented.

1. Preliminaries. The game leader divides the players into a suitable number of teams. He or she briefly explains that the teams are about to participate in a policy-council meeting, specifies the issue upon which policies are to be set, and provides background information about the context in which the meeting takes place.

    There are 23 players and Fred, our game leader, divides them into five teams. Three teams end up with five players and the other two with four, but this does not matter. Fred explains that they are about to simulate the deliberations of the presidential advisory commission of a small developing nation in Southeast Asia. This nation has a rapidly growing population rate which is holding up their drive toward self-sufficiency in food production. The council is given the task of coming us with policies for reducing the birth rate in the country.

2. Generating individual lists. Each team prepares a list of five suggested policies in the specified areas. Members of each team collaborate with each other in this task, but no team is permitted to consult with another team.

    Fred explains what is to be done during the first phase of the game. He suggests that the team work fast because there is a ten-minute time limit for coming up with a list of policies. Here are the lists generated by different teams:

    Alan's team:

    1. Encourage national research in inexpensive and reliable contraceptive devices.
    2. Distribute birth-control pills at a subsidized rate to working women in urban areas.
    3. Strongly encourage women to undergo sterilization when they are in the hospitals to deliver their babies.
    4. Introduce lessons on the dangers of rapid population growth in the elementary and high-school curricula.
    5. Produce documentary films on the plight of large families.

Barbara's team:

1. Concentrate upon educating rural women on the advantages of having a small family.
2. Implement compulsory vasectomy of men with more than three children.
3. Improve infant health care so that babies have greater chances of living.
4. Increase job opportunities for women.
5. Deny promotion of civil servants with more than three children.

Charlie's team:

1. Make surgical sterilization of men and women freely available.
2. Deny government-subsidized housing to large families.
3. Develop a system of old age pensions so that senior citizens are not dependent upon their children.
4. Train a large army of family-planning workers to spread the message in rural areas.
5. Concentrate upon the use of the IUD loop on a large scale.

Diana's team:

1. Relax abortion law.
2. Mobilize religious opinion in favor of birth control.
3. Undertake a concentrated media blitz on birth control.
4. Offer financial incentives to parents with few children (e.g., negative income tax exemptions).
5. Supply contraceptive devices free-of-charge to poor people in villages.

Esther's team:

1. Encourage men to undergo vasectomies.
2. Widely disseminate informaiton upon contraceptive techniques.
3. Offer cash incentives to moviemakers who produce feature films about family planning.
4. Make contraceptive devices freely and widely available to anyone who needs them.
5. Discourage large families by increasing the financial burden on the parents.

3. Creating a common list. The game leader asks each team to read aloud one suggested policy from its list which s/he writes upon the chalkboard. Teams try to contribute policies which are different from those already upon the list. This procedure is continued until the common list upon the chalkboard contains ten policy suggestions.

   Alan's team starts off the common list with the first policy from their list. Fred summarizes it upon the chalkboard. Other teams take turns contributing their policies to the common list, which ends up with the following ten items.

   1. Encourage research upon contraception.
   2. Increase job opportunities for women.
   3. Wide dissemination of contraceptive information.
   4. Media propaganda blitz.
   5. Free surgical sterilization.
   6. Cheap birth control pills.
   7. Compulsory vasectomy.
   8. Old age pension.
   9. Free contraceptives.
   10. Financial burdens upon parents of large families.

4. Selecting the most acceptable policy. Each team now studies the common list and selects the one policy which it believes to be the most acceptable one to different people. The game leader secretly collects the choices of each team and announces them after all teams have decided.

   During this phase, Alan's and Esther's team chose Item 6 ("Cheap birth control pills"). Charlie's and Barbara's chose Item 3 ("Wider dissemination"), and Diana's team chose Item 5 ("Free surgical sterilization").

5. Scoring the round. The game leader computes a score for each team which equals the number of teams selecting the same policy. (This score rewards consensus).

   Scores for the team at the end of the first round are two each for Alan's, Esther's, Barbara's, and Charlie's Teams and one for Diana's team.

6. Ranking the policy. The policy which receives the most choices is crossed off the common list and

given the first rank for acceptability. If more than one policy is ranked, the players are given a brief debate period during which they elaborate upon the relative merits of their choices and try to persuade each other. Then the teams return to another round of secret selection during which they stay with their original choice or shift to a new policy.

No policy is crossed off at the end of the first round because of the tie between Items 3 and 6 with two votes each. There is a two-minute debate period during which various persuasive points are made: "People don't know anything about contraception. You've got to teach them that it is possible". "Surgery is more reliable than the pill and it is guaranteed to bring down the birth rate". During the ensuing round, Alan's team shifts to Item 2. Esther's team shifts from Item 6 to Item 3 and joins Charlie's and Barbara's. Diana's team stays with the original choice of free sterilization. this gives the following scores to the team for the second round: Barbara, Charlie, and Esther, three each; and Alan and Diana, one each.

7. Recycling. After crossing off the first-ranked policy from the common list, the game procedure is repeated for identifying the next four most-acceptable policies, one at a time. During each round, the team makes confidential choices and the game leader reveals them and announces scores. The policy which receives the most votes during each round is crossed off the common list.

The game proceeds according to the rules for five more rounds to determine the next four acceptable policies. (One of the rounds ends in a two-way tie.) At the end of this phase, the five selected policies are:

- Wider dissemination of contraceptive information.
- Free surgical sterilization.
- Financial burdens upon parents of large families.
- Increase job opportunities for women.
- Research upon contraception.

8. Determining the winners. The game comes to an end when the five policies have been identified. Each team adds up the score points it has accumulated during the earlier rounds of voting; the team with the highest score wins the game.

In addition to winning the game based upon this consensus score, teams may compare their performance upon another criterion. Each team checks its original list of five policy suggestions against the top five policies identified from the common list. The team which has more of its original suggestions (or reasonable facsimiles thereof) among the top five than does any other team, is declared to be the winners by the criterion.

Total scores for the different teams are 16 each for Alan's and Diana's, 18 for Esther's, 20 for Charlie's and 22 for Barbara's. Hence, Barbara's team is declared the winner in the consus category. Esther's original list is found to contain three policies which made the top five. Her team wins an award for this.

Variations

1. The length of this game can be shortened by reducing the number of policies. For example, you may require each team to list three policies and make a common list with six, from which the top three are selected.
2. Another way to speed up the game is do away with the first phase during which each team generates its own list. You can begin with a ready-made list of ten policies and have the teams identify the top five using the procedure in the latter phase of the game.

Suggested Alternative Topics:

- Nutritional policy in a developing nation.
- Fuel policy in a developed nation.
- International policy about weather modification.
- International policy about harvesting the seas.
- Agricultural credit policy of a federal bank in developing region.

To summarize, the frame game is not a new concept. Designers, educators, even parents have been adapting successful games to accomodate new objectives and content (or materials and media) for centuries. (For an excellent example of this process during the eighteenth and nineteenth centuries in Europe,(see Love, 1978), particularly with reference to the JEU De L'OIE, pp. 6-9 and pp. 18-19.) Active interest in documenting the procedure and rendering it a stable technology has been very recent and mainly dependent upon the work of Richard Duke, Fred Goodman, Cathy Greenblat, Ansel Horn, Harold Stolovitch, and most especially Sivasailam Thiagarajan. Of particular relevance to those interested in the newer frame games is the following list:

Amberstone, A., and Amberstone, W.
    THE POWER GAME
Armstrong, R. H. R., and Hobson, N.
    NEXUS
Coppard, L. C.
    POLICYPLAN
Duke, R. D., Becker, H., and Greenblat, C. S.
    CONFERENCE GAMES
Duke, R. D., and Greenblat, C. S.
    AT-ISSUE
Duke, R. D., and Greenblat, C. S.
    IMPASSE
Duke, R. D., and Stenber, N.
    GENERAL SYSTEMS GAME
Fennessey, G. M., and Schild, E. O.
    INFORMATION
Horn, A.
    A GAME FACILITATOR
Horn, A., and Goodman, F. L.
    RUMMAGING
Horn, A., and Steinwachs, B.
    PIECE OF MIND
Instructional Simulations, Inc.
    SYSTEM 1
Klietsch, R. G.
    ORACLE-QUEST-ORDER
Tombaugh, R. F., and Davis, J.
    PX-190
Twelker, P. A.
    CONDUCTING PLANNING EXERCISES

All of these are described in Horn (1976), together with information concerning how they may be obtained. A more recent guide can be found in Horn and Cleaves (1980). For the designer of instruction, the frame game is an extremely potent tool for generating motivating and effecting interactive teaching and learning.

GAME CHAINS

As far as the author is aware, this is the first time the term "Game Chain" is being publicly presented althought the concept is one which has certainly existed and been utilized in the past. (See especially Thiagarajan, 1975). The game chain is precisely what the term suggests: a sequencing of games which are interrelated so that the output of one game becomes the input or starting point for another game, (Figure 19-5).

Game chains can occur in many varieties and do not necessarily have to be linearly related (Figure 19-6).

In some instances, input, in addition to a previous game's results, may be required to initiate activity. Another variation permits an initial game to "set the stage" or build a sensitivity toward an area under study. Thus it is the content and atmosphere of the game, more than its results, that subsequently prime the next game in the chain, (Figure 19-7).

An example of this type of chain dealing with future forecasting will be presented later in this chapter. At this point it is appropriate to turn to the relationship between frame games and game chains and show them how together they can create interactive teaching/learning sessions that may extend over lengthy periods of time, allowing new elements to be added while building upon the old.

FRAME GAMES AND GAME CHAINS

The frame game permits the instructional designer/developer to create rapidly--and with some prior guarantee of success--a learning game that meets the needs of her/his targetted learner group. The GAMEgames, in particular, stress interaction among player-learners. Combined in

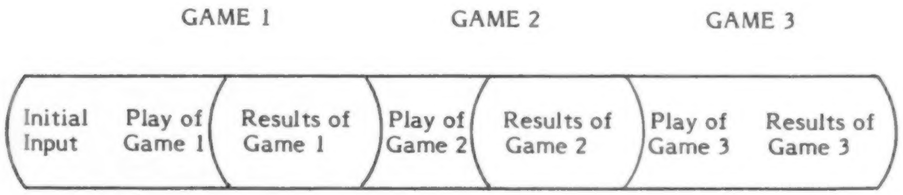

Figure 19-5.

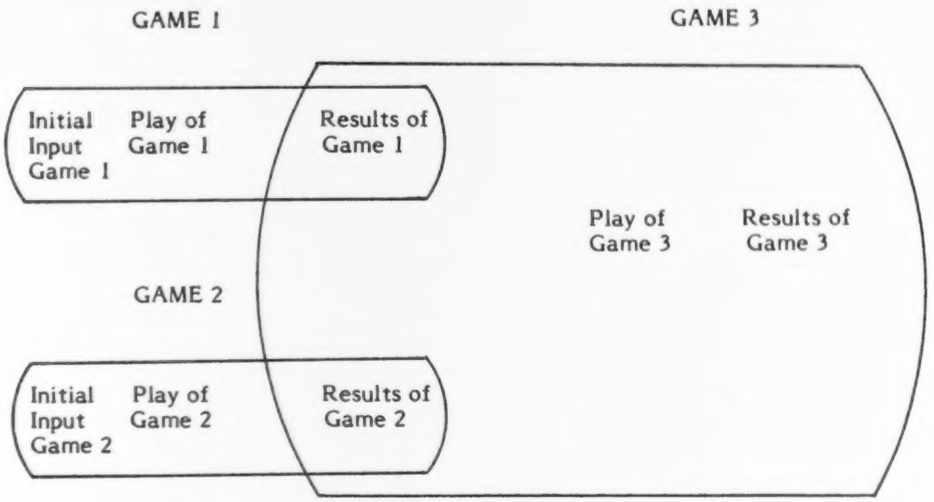
GAME 1
GAME 3
Initial Input Game 1
Play of Game 1
Results of Game 1
Play of Game 3
Results of Game 3
GAME 2
Initial Input Game 2
Play of Game 2
Results of Game 2

Figure 19-6.

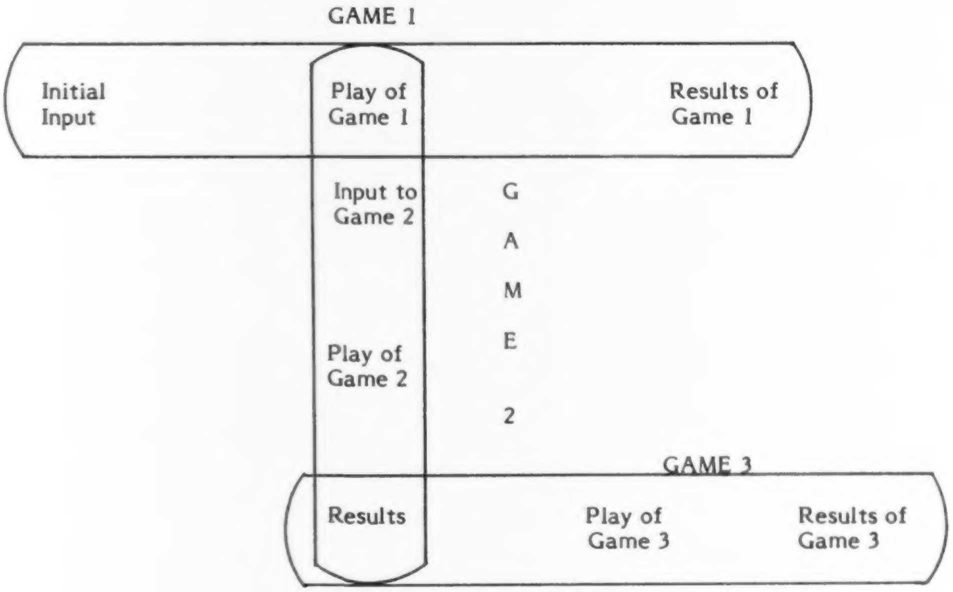
GAME 1
Initial Input
Play of Game 1
Results of Game 1
Input to Game 2
GAME 2
Play of Game 2
GAME 3
Results
Play of Game 3
Results of Game 3

Figure 19-7.

chains, the instructional designer can select suitable frame games and create learning situations which allow learners to constantly build upon what they have achieved in the previous games. Knitting the chains together and directing them so that usable outputs emerge requires skill and management talent upon the part of designers and instructors. But this is true with all instructional materials.

To illustrate how frame games and game chains can be united into a powerful instructional tool, the author presents two illustrations from his own teaching experience. Both examples involve adult learners, but he has also used other game chains with younger learners, as well as with the mentally handicapped. Because of space restrictions, both game chains are presented in resume only. The second of these, however, is extensively described in Stolovitch, 1979.

Community Radio

A class of undergraduate students in communications at the Universite du Quebec a Montreal participated in this series of games. The purpose of the entire exercise was to have students identify communities which were being underserved by metropolitan Montreal's community radio stations, select one or several of these priority underserved groups, come up with a broadcast series for meeting the needs of each of the groups, and actually initiate planning of a viable series.

Game 1 had as its objective to identify high priority communities that are underserved by community radio in Montreal. The NEEDS ANALYSIS GAME frame was selected for this purpose. All participants had already worked in community radio as student interns and were familiar with the subject area. The students were divided into five teams. A simulated memo from the director of programming of a fictitious radio station set the stage for the activity. During the first round of the game, each team identified five underserved groups. When placed upon a common public list (with redundancies removed), the following groups appeared:

1. 18-25 year-old unmarried "cruisers"
2. 16-20 year-old females and males in general
3. Employees of services and companies that deal with the public
4. 15-25 year-old unemployed persons
5. Drunks and vagabonds
6. Homosexuals
7. The physically handicapped
8. Ecology-minded listeners
9. Prisoners
10. Soldiers
11. Persons frequenting "intellectual" cafes
12. Boys and girls 8-12 years old
13. Pet owners
14. Farmers who have moved to the city

By the end of the game consensus formed around three groups who required immediate attention:

1. 18-25 unmarried "cruisers" (those looking to meet unattached females/males for an evening of enjoyment).
2. Persons frequenting "intellectual" cafes.
3. Boys and girls 8-12 years old.

The game lasted 50 minutes from start to finish. Game 2 required the participants to redivide themselves into three new teams, each one concentrating upon one of the priority groups identified in Game 1. Each team was to come up with as many ideas for radio series as they could within a 15 minute time limit. Each idea was placed upon a separate index card. Each group's card was of a different color. Below is an example of what the "Young Cruisers" team came up with:

- Advice and information about veneral diseases
- Drug overdosing, alcoholism, etc. and you
- Clothes and food
- Sports--the inexpensive way
- Careers and professions
- Music and shows
- Travel--inexpensive opportunities

Each team arranged the cards in the order of its preferences and then assigned points upon the back of the card. If there were seven choices (as above), the first choice received seven points, the second, six points, and so on. Teams then mixed up the cards and passed their set to the adjacent team, who now reordered the series of cards according to their considered opinions. Once reordered, they turned over the cards and assigned their points. Only when they turned the cards over did they see the other team's ratings. Once again the cards were shuffled and passed for a third rating. The purpose here was to have everyone examine all suggestions and together in small groups argue and evaluate series ideas, gaining input from everyone, so as to identify a series appealing to all. Here is how the "Young Cruisers" ideas were rated:

-	Advice and information about venereal diseases	7+6+7=20
-	Drug overdosing, alcholism, etc. and you	1+6+6=13
-	Clothes and food	7+3+3=13
-	Sports--the inexpensive way	2+1+1=4
-	Careers and professions	3+5+5=13
-	Music and shows	4+4+4=12
-	Travel--inexpensive opportunities	2+2+5=9

Advice and information about venereal diseases was almost a unanimous first choice. Other first choices were initiation into the cultural world for 8-12 year-olds and information about theatre, music, cinema, exhibitions, cultural events and parties for cafe intellectuals. The game required 40 minutes (including a debriefing) to complete.

The third game had each team from Game 2 take up, in turn, the number one series idea from the other two teams and generate a specific series-proposal to include:

- The series title
- Number of broadcasts in the series
- Air time for each broadcast including time slot
- Format
- Personnel requirements
- Special features

Teams simultaneously prepared proposals for different series. After 20 minutes, each team prepared a second proposal for a new series. Finally, each team evaluated the two series ideas the other teams presented and rated them, accepting one and rejecting the other with explanation and, if necessary, modification and reservation. Here is how the third game proceeded using the "Young Cruisers" team to illustrate:

1. Young Cruisers team prepares proposal upon "cultural initiation" for 8-12 year olds.
2. Young Cruisers team prepares proposal upon information for cafe intellectuals.
3. Young Cruisers team examines and critically evaluates two proposals other teams have prepared for cruisers upon venereal diseases, accepting, rejecting and modifying.

This game lasted 60 minutes in all.

The fourth and final game was based upon Thiagarajan's PRESS CONFERENCE GAME (Thiagarajan, 1978). Here each individual prepares questions in pre-specified categories about a given topic. Each question is written upon a separate card. All questions are then collected and sorted by categories. Learner-players are randomly divided into as many groups of reporters as there are question categories (usually four). Each group receives all the prepared questions in a given category and arranges, edits and adds or delets from them in preparation for a press conference. Each reporter-group has ten minutes for questions and answers. The group totally controls the question-and-answer period during its turn and can cut off the expert at any time. All of a group's questions deal with one aspect of the overall topic. All reporter-groups listen and take notes about what is being said, even when their own group is not questioning. When all questions have been asked and answered, each team prepares and then reads aloud a communique about the press conference. The expert(s) rate(s) the communiques for accuracy, consensus and how well they have synthesized the information.

In our example, two experts, one from a community radio station and the other from the Canadian Broadcasting Corporation (CBC), fielded questions about submitting programme proposals, preparing for broadcasting a series, broadcasting a series, and evaluating the impact of a radio series during the simulated PRESS CONFERENCE.

Student teams then summarized key points in press communiques. These were judged by the experts in terms of how well and how accurately they reflected what had been stated about the various technical phases of gearing up for and actually running a community radio series. Total time for the game was two hours.

As can be seen from the example, four frame games were used to take the entire student group through the phases of identifying audiences, selecting priority audiences, selecting programming for these audiences, (both series and individual broadcasts), proposing and evaluating series ideas, and examining many of the technical details involved in launching, maintaining and evaluating a community radio broadcast series. Because in real life it is always persons working together who are involved in preparing radio programmes, the interactive formats of the frame games presented highly appropriate vehicles for achieving the objectives. The chain of games permitted a natural build-up of ideas and information. Numerous positive side-effects also emerged from the games:

- Participants relaized that they were favoring audiences with which they themselves were most familiar--a bias to be avoided.
- Constantly plagued with insufficient information, the student players realized the importance of going out and gathering data before launching programme ideas or hypothesizing audience characteristics.
- Shier team members found that they were forced to contribute to team efforts and were participating more.
- Through the game, all students got to work and argue with one another and found they learned a lot about each other.
- Since each team's press communiques were later typed, photocopied, and circulated to all class members, everyone had very complete notes on the expert sessions.
- Several of the students decided to work up their series ideas into real proposals and present them to their station.

All of the students were highly enthusiastic about the game sessions.

Future Forecasting

Stolovitch (1979) describes a series of four activities designed to focus attention upon the future. The first of these, FUTURE HEADLINES, created by Dean Spitzer, directs the attention of participants toward the future. It is an amusing and non-threatening game which draws participants away from their day-to-day concerns and gives them a feel for the future. The results of the game are not reused in later games, but the future orientation that grows throughout FUTURE HEADLINES sets the stage for the next three game activities.

MINI-DELPHI (Stolovitch, 1976) is designed to narrow the focus upon the future to what is likely to occur in a given field by a given date. Whether the group consists of industrial trainers, elementary-school children, or pipe fitters, the game requires everyone to look to the future and to consider where they are headed.

- AFAR: ALTERNATIVE FUTURE ANALYSIS AND REVIEW (Thiagarajan, 1976) focuses upon desirable futures. This activity tries to answer the question: What would we all like to see happening by the year "X"?
- SCI-FI: STRATEGIES FOR CONCRETIZING IDENTIFIED FUTURE IMAGES (Dormant, 1977) gets participants to consider what they can do to bring about the desirable futures they have indentified (from AFAR) in the light of what is likely to occur (from MINI-DELPHI). It forces individuals and teams to specify actions to be taken **now** that can have a positive impact upon the future.

As with the previous example, all the games are frame games waiting to be loaded with whatever appropriate content the instructional designer wishes.

CONCLUSION

This chapter started out with an explanation of the concept of frame games, providing several examples of the frame-game process applied to instructional settings. It then introduced the newer concept of game chains with some of their possible variations. Finally, frame games and game chains were married in order to demonstrate how together they offer an exciting and effective technology for interactive teaching/learning. Instructional designers, trainers and teachers who seek means for helping their learners attain objectives which require communication, group decision-making, team planning or simple interactive skills should certainly explore this combination design.

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Chapter 20

Advance Organizers: Their Construction and Use in Instructional Development

John Newell

Behavioral objectives, evaluation, media selection, and proper reinforcement scheduling are not adequate to ensure learning. The design of appropriate learning strategies, and their incorporation into the learning materials, lectures, discussions, laboratory exercises and other interactions between the student and the instructional system are necessary if the learner is to achieve the terminal objectives.

One learning strategy which has received a great deal of attention is the use of advance organizers. Advance organizers are small units of instruction which are presented in advance of the central unit of instruction. These small units are not introductions or overviews, but are units which prepare the learner's cognitive structure for receiving and integrating the new content.

The ability to design such a learning tool would seem to be of great value to an instructional developer.

INTRODUCTION

The fundamental idea associated with the advance-organizer concept is quite simple and logical. An advance organizer is content which is presented in advance of some other content which is to be learned. The advance organizer is designed to facilitate the learning and retention of the material which follows it. The advance organizer serves as a bridge or anchorage, relating the material to be learned to information already known by the student. Despite this apparently rather logical and straightforward conceptualization of the role of an advance organizer, there has been a consistent history of debate and controversy surrounding it. There have been reviews of the research which has been conducted on the advance organizer, concluding that advance organizers do not facilitate learning and retention to any significant degree. Other reviews have challenged these conclusions. Questions have been raised about the specific attributes or characteristics of an advance organizer, and it has been argued that little is known about how to construct an effective advance organizer.

Despite all of the debate and controversy surrounding the advance-organizer concept, two general comments appear to be beyond debate. First, the advance organizer continues to be both a popular instructional strategy and the object of continuous research efforts in a wide variety of educational settings; and, second, existing research is able to tell us a number of fundamental facts about the structure and attributes of advance organizers and their value in instructional development.

The purpose of this chapter is to review briefly the theoretical and historical roots of the advance-organizer concept, to summarize some of the most relevant research on the advance organizer, and, finally, to analyze existing evidence concerning the construction and application of advance organizers in a number of instructional settings.

THEORETICAL BACKGROUND:

The advance-organizer concept was originally introduced in the 1950s by Dr. David P. Ausubel (1963), who is also credited with coining its name. Before reviewing some of the more basic beliefs and assumptions associated with advance organizers, it is important that the reader have an appreciation of the historical milieu surrounding their development, since this history has contributed, in part, to the debate and controversy concerning them. At the time when Ausubel first introduced the advance organizer and his supporting research in The Psychology of Meaningful Verbal Learning (1963), American psychology had embraced the behavioristic position of B. F. Skinner. Behaviorism not only focused upon observable and measurable behavior, but also rejected as unscientific any use of "internal" mechanisms such as memory, thinking, or information processing in describing how individuals learned. Ausubel was clearly ahead of his time in developing this theory of learning, and his ideas and concepts were not well-received by the bulk of American psychologists.

The advance-organizer concept was clearly non-behavioristic and focused upon an information-processing approach to learning. Ausubel's approach is built upon the belief that the information-processing system of humans is composed of a set of ideas which provides an anchorage for new information as it is received (learned). These ideas also provide a storehouse for new meanings when they are acquired. This repository of new and old ideas is called the cognitive structure. Cognitive structure is a hypothetical mechanism in which past learning is stored and held for later recall and in which new ideas are processed and finally stored. Ausubel argued that new ideas and concepts can be learned effectively only to the extent to which they can be related to already-existing concepts and ideas in the cognitive structure, which provide the necessary anchorage for this new information. Ausubel expressed this fundamental position most eloquently in the introduction to his book, Educational Psychology: A Cognitive View (1968) when he stated: "If we had to reduce all of educational psychology to just one principle, we would say this: The most important single factor influencing learning is what the learner already knows. Ascertain this and teach him accordingly." In addition to being the repository of ideas and concepts, cognitive structure is also where new information combines with information which already exists. The role of the classroom teacher, then, is to transmit an organized set of concepts in a way that allows the learner to incorporate them into his existing knowledge, so that the new information becomes an integral part of the individual's knowledge-system. Stated another way, cognitive structure serves as the major mechanism in the processing of new information and in its integration with existing ideas and concepts.

Ausubel believed strongly that each academic discipline, such as English, history, and the like, is composed of a structure of concepts which form the core of that discipline. These concepts are organized within each discipline in a hierarchical manner from general to specific. Ausubel believed that each discipline had its own unique organization of concepts, and that it is therefore inappropriate to apply the organization of one discipline to the analysis of a different discipline. Instead, he argued that the teacher must examine each discipline and discover the unique organizational structure of concepts associated with that discipline. He argued that the combining of different disciplines into a "core program", such as the combination of English and social studies, violates the uniqueness of the structure of these two disciplines and results in ineffective learning and retention. Finally, Ausubel believed that the structure of each discipline is hierarchically organized from general to specific. He pointed out that, "Generally speaking, therefore, it makes good organizational sense if the presentation of more detailed and specific information is preceded by a more general or inclusive principle to which it can be related or under which it can be related or under which it can subsumed" (1978b).

Unlike many other approaches to learning, Ausubel developed his theoretical position in order to explain the kinds of learning that occur in the classroom rather than those which occur in the research laboratory. Ausubel, more than any other educational psychologist, attempted to develop a view of learning which was based upon classroom learning. As a result of this focus, Ausubel distinguished between "rote" and "meaningful" learning. He believed that meaningful learning was subject to different rules than was rote learning. He pointed out that the contents of materials learned by rote could not be related to ideas and concepts that existed in cognitive structure, since rote learning requires the learning of the material in an exact, arbitrary form. Meaningful learning, on the other hand, is relatable to prior knowledge in cognitive structure and does not have to be learned in an arbitrary manner. This is not to suggest that Ausubel believed that no rote learning occurs in the classroom. Learning the alphabet, the multiplication facts, or the capitols of the states in the United States are all examples of rote learning. These are learned through continuous practice and they are forgotten rather easily.

Not only is Ausubel interested primarily in meaningful learning, but he is also an advocate of reception learning, rather than of discovery learning. He described reception learning as the process in which the major content of what is to be learned is presented to the learner by the teacher in more or less its final form. Discovery learning, on the other hand, is viewed as the process whereby the learner must discover the content of the material to be learned. Since Ausubel's reasons for favoring reception learning over discovery learning are associated with his views concerning the role of development in the learner, an explanation of his preference for reception learning will be presented with the discussion of his view of human development.

Finally, Ausubel is interested not only in learning, but also in the long-term retention of that learning. He felt that what is learned in the classroom should be available for recall by the learner at times well beyond the time of the actual learning.

At this point, the advance organizer concept should be given a more precise definition, one which stresses the relationship of advance organizers to the basic beliefs presented above. Ausubel defined an advance organizer as material presented at a higher level of abstraction, generality, and inclusiveness than the material to be learned (1978b). The reader may recall Ausubel's suggestion that material to be presented should be organized from general to specific. His definition of an advance organizer is consistent with that suggestion; the definition describes an advance organizer as being at a more general and inclusive level with fewer specific facts than the material to be learned.

An advance organizer is effective in the facilitation of learning and retention to the extent that the material in the advance organizer can be related to the material to be learned. As Ausubel has stated, find out what the learner already knows and start from there. Two types of organizers have been described, and their differences depend upon the relative familiarity of the learner with the material to be learned. When the material to be learned is quite unfamiliar to the learner, an expository organizer is used. The expository organizer is designed to provide general, superordinate concepts and prinicples which are already familiar to the learner and which will provide a bridge to the new material to be learned. The material may be unfamiliar to the learner for two reasons. First, it may be material which is difficult and complex and for which the learner has little if any past experience to which the new material can be directly related. A first introduction to computer programming is an example of this type of material. A second reason why the material may be unfamiliar to the learner is that the learner has low or limited verbal ability. The less-able learner often possess a more restricted and limited background of information and concepts in his cognitive structure. Such learners would benefit from a presentation, in the form of an expository advance organizer, of an organized anchoring structure of concepts; these would allow the learner to better relate the new material to the limited prior knowledge available in cognitive structure.

In those instances in which the material to be learned is somewhat more familiar to the learner, a comparative organizer is used. The comparative organizer functions to integrate the new material to be learned with basically similar concepts already in cognitive structure, and to increase or emphasize the differences between the new material and the already-existing ideas and concepts. The intent of a comparative organizer is to distinguish between two ideas that are basically different but which may be confused as being similar. The distinction between the "language experience" and the "phonetic" approaches to reading might be such an example. These two approaches may appear to be quite similar, but are, in fact, derived from quite different beliefs and approaches concerning the teaching of reading.

In all of the debate over whether or not advance organizers are effective in facilitating learning and retention, a basic fact about advance organizers has been ignored. Ausubel never claimed that there was anything absolute about an advance organizer or that organizers will always be effective in the facilitation of learning and retention. He has pointed out repeatedly that the overall effectiveness of an advance organizer is dependent upon three major factors. Ausubel stated, "Apart from describing organizers in general terms with appropriate examples, one cannot be more specific about the construction of an organizer; for this always depends upon the nature of the learning material, the age of the learner, and his degree of prior familiarity with the learning passage." (1978a). There is also some evidence that the ability level of the learner is an important factor. Since a good deal of the criticism of advance organizers has focused upon their construction, these characteristics of an advance organizer should be examined in greater detail.

It seems quite obvious that the nature of the content to be learned must be taken into account in constructing an advance organizer. First, the content or cognitive material to be learned must be meaningfully presented, and not in a form to be learned rotely. This characteristic has already been discussed. Second, Ausubel has pointed out that advance organizers probably facilitate the learning of factual material more than they do the learning of abstract material, since abstractions contain their own built-in organizers. (1978b).

While there has been no conclusive evidence presented to date, there are suggestions that the ability of the learner may be an explanatory factor in the facilitating effect of an advance organizer. One explanation for the relative facilitating effect of an advance organizer is that high-ability learners either already possess or are able to develop an organizing anchorage for either factual or abstract material. On the other hand, so the argument goes, low-ability learners neither possess nor are able to generate an organizing structure when learning new content.

Let us turn briefly to the third characteristic, the degree of prior familiarity with the learning passage. there is some general agreement that advance organizers are most effective when the content to be learned is unfamiliar to the learner. The greater the degree of unfamiliarity, the less likely the learner is to be able to develop her/his own organizer, regardless of her/his ability level.

There have been some suggestions that the way in which the content to be learned is organized may have an impact upon the effectiveness of the advance organizer, but this has yet to be demonstrated in any conclusive manner. For example, the role of imagery-producing words in the material to be learned may be important, since high-imagery words are learned more easily and retained for longer periods of time. The whole issue of the relative effectiveness of visual-versus-written prose materials, and combinations of these two modalities, needs to be examined more closely as it relates to the effectiveness of advance organizers. Finally, the issue of whether to intersperse a number of organizers within the material to be learned needs further examination. Some evidence for this approach is discussed later in this chapter.

There is clear evidence that the age of the learner has an effect not only upon how advance organizers should be constructed but also upon their effectiveness in facilitating learning and retention. Since Ausubel has adapted Piaget's stages of cognitive development in discussing the effects of different ages upon learning, these stages should be presented briefly before returning to Ausubel. Piaget described the cognitive development of a child in terms of three major stages of development, each of which differs in significant ways from the other stages. The child must pass through each stage in succession, and the cognitive development in one stage serves as a prerequisite to the development which takes place in the next stage. A child does not enter or leave a given stage abruptly; a given stage gradually merges with the next higher stage of development over a period of time. A child may not skip a stage, and some individuals never reach the final stage of cognitive development. Ausubel has adapted Piaget's work by placing these stages on a concrete-abstract continuum. (1978b).

The first stage, the pre-operational stage, includes the pre-school years. In this stage the child is able to acquire concepts only if they are closely associated with concrete experiences. If there are no direct concrete references available to support the concept, the child is unable to deal efffectively with that concept. For example, in this stage of development, the child is unable to deal with concepts such as reversibility or conservation of mass in any real sense. During the pre-operational stage the child experiences the world about him, and an exposure to as many different experiences as possible will provide a firm foundation upon which future cognitive structure is built. While Ausubel has argued for the general efficacy of reception learning over discovery learning, it is in this pre-operational stage that guided-discovery learning is most effective. The use of guided-discovery activities, such as visits to the zoo and to the grocery store, or exposure to picture books, will expand the experiential background of the learner. This early intellectual stimulation provides the beginnings of elements in cognitive structure which will serve as a basis for the more complex development of abstractions, concepts, and priciples in a later developmental period. Ausubel points out that inthis pre-operational period, the child is capable of employing primary concepts, but not secondary concepts. Ausubel defines primary concepts as, "...those concepts whose meanings a given individual originally learns in relation to genuine concrete-empirical experience." (1978b). The important element here is the requirement that the concept be directly related to some concrete-empirical experience. At this stage of development, the child is not capable of learning secondary concepts which s/he can not relate directly to concrete experiences.

The next stage of development is called the concrete-operational stage, and usually occupies the elementary school years. In this stage of development the learner begins to deal with concepts which are not directly associated with concrete experiences. That is, the learner begins to deal with secondary concepts, rather than just with primary ones. Ausubel defines secondary concepts as "...those with meanings a given individual does not learn in relation to genuine concrete-empirical experience; that is, those concepts whose criterial attributes yield generic meanings during learning when these attributes are related to the individual's cognitive structure without being first explicitly related to the particular exemplars from which they are derived." (1978b). Ausubel points out that in the concrete-operational stage the learner begins to depend less upon concrete props in developing concepts. The learner is able to develop a concept from a single concrete prop rather than being dependent upon several concrete props; the concrete props appear to serve more as a "crutch" in developing concepts rather than being the primary source of the attributes of the concept. Thus the learner is now able to deal more effectively with abstract concepts such as reversibility and conservation of mass. Advance organizers for learners in this stage of development can be more abstract and inclusive than for learners in the previous stage, but concrete props must still be included. The final stage is called the abstract-logical stage and is associated with the junior high (middle school) and high school years. It is in this stage that the learner demonstrates his ability to deal with the world in terms of abstract concepts; the dependence on concrete props decreases dramatically. An important aspect of this stage of cognitive development is the ability of the learner to go beyond the "here and now" and to deal with the future, the possible, and the consequences of their actions and can, in their imagination, work through a problem in the absence of any concrete props. Advance organizers for this stage of development can be more abstract and inclusive than for the previous stages and need not include concrete props.

The three developmental stages just discussed are related to the chronological age of the learner. As a learner increases in cognitive maturity and moves from one stage to the next, the ability of the learner to interact with the world in terms of abstract concepts increases, and advance organizers must reflect his increased ability to think abstractly. This increase in cognitive maturity also results in a more complex cognitive structure having more concepts available which can be related to new material as it is learned.

Earlier in this chapter, it was stated that Ausubel preferred reception learning to discovery learning. It should be clear that, in terms of the stages of cognitive development just presented, the young learner who is in the pre-operational stage will benefit from a broad exposure to the concrete events of the environment. These experiences will constitute the beginnings of cognitive structure, but will not be organized into concepts except at the most simple level. This exposure to the environment can best be accomplished by guided-discovery teaching-strategies. When the learner is able to deal with the world at the abstract-logical state (using such abstract forms as reading material and lectures) the most effective teaching strategy becomes reception learning. The learner at this stage possesses the ability to deal with the world through abstract concepts, has a more complex cognitive structure that can be related to new learning, and is not dependent upon concrete exemplars of the concept. As Ausubel pointed out, under these circumstances it is more efficient and effective to "tell" the learner what you wish him to know, rather than require him to discover this information on his own. Ausubel described meaningful reception learning as follows: "...symbolically expressed ideas (which) are related in a nonarbitrary and substantive fashion to what the learner already knows. By substantive and nonarbitrary relatedness we mean that the ideas are related to some specifically relevant existing aspect of the learner's cognitive structure, such as an image, an already-meaningful symbol, a concept or proposition." (1978b). The two terms "nonarbitrary" and "substantive" are central to Ausubel's distinction between meaningful and rote learning. By nonarbitrary, Ausubel is referring to the characteristics of the learning content that makes that content relatable to what already exists in cognitive structure. There is nonrandomness in the material; that is, there is an inherent structure to the content which the learner can perceive or find, at least potentially. It follows recognized rules of syntax and grammatical construction. An example of arbitrary learning material would be nonsense syllables, such as XUV, which follow no recognized rules of syntax or grammar and cannot be directly related to existing cognitive structure. Thus it must be learned rotely in a verbatim fashion. Nonarbitrary learning material may, at first, be non-meaningful, or as Ausubel described it, only potentially meaningful. A passage of Russian prose for a student with no prior knowledge of Russian would be potentially meaningful. Once the student has sufficient vocabulary and the rules of grammar for Russian in her/his cognitive structure, then the Russian prose passage can be directly related to cognitive structure in a non-random way.

The term "substantive" is closely related to the characteristic of nonarbitrary. By "substantive" Ausubel is referring to the characteristic of the learning material that allows it to be related to cognitive structure without a loss or change in meaning. If the concept to be learned can be restated in words other than those in which it was originally presented without changing its meaning, the requirement that the learning material is substantive has been met. In the case of the nonsense syllable, XUV, it is not only learned in an arbitrary and exact manner, but there is no possibility of restating XUV in any other way and retaining whatever meaning that nonsense syllable may possess. On the other hand, the translation of a passage of Russian prose can be done according to recognized rules of syntax and grammar, and the translation can be performed in a number of different ways without the loss of the meaning of that passage.

The central task of the teacher, then, is to present content to the learner using reception learning. This content should be presented in such a way that it has the potential for being meaningful; that is, in such a way that the material can be directly related to what already exists in cognitive structure and which can be recalled at a later time in a number of different ways without the loss of the meaning of that material. Ausubel has summarized the task of the teacher as folows, "Precise and integrated understandings are, presumably, more likely to develop if: (1) The central unifying ideas of a discipline are learned before more peripheral concepts and information are introduced; (2) The limiting conditions of general developmental readiness are observed; (3) Precise and accurate definition is stressed, and emphasis is placed upon delineating similarities and differences between related concepts; and (4) Learners are required to reformulate new propositions in their own words." (1978b).

Before examining some of the research evidence relating to advance organizers, the reader should be aware that what has just been presented has focused exclusively on the advance-organizer concept and represents only a very small part of Ausubel's total theory of meaningful learning. The way in which new learning material is related to existing cognitive structure, the assimilation of that new information into what already exists in cognitive structure, and the procedures used to recall material that has been learned, are part of Ausubel's theory, but have not been presented here. The advance organizer concept has received considerable attention in the research literature and in instructional development, but this concept is only a small part of Ausubel's position.

RESEARCH BACKGROUND

The research which has examined the facilitative effects of advance organizers upon learning and retention is extensive, confusing, and contradictory. In the following section, a small sample of the existing research evidence will be presented and the reader will, no doubt, sense the confusion and contradictions that exist. It would be impossible to adequately review all of the existing research literature. Fortunately, there are a number of summaries and literature reviews which make this author's task much easier. Before examining the findings reported in these summaries, two representative advance-organizer studies will be presented in order to provide the reader with the flavor of the types of studies conducted in research on advance organizers, and of the types of questions these studies ask.

One of the most frequently cited studies on advance organizers was reported by Ausubel in 1960. He describes the purpose of his study as follows: "The purpose of this study is to test the hypothesis that the learning and retention of unfamiliar but meaningful verbal material can be facilitated by the advance introduction of relevant subsuming concepts (organizers)." Ausubel asked 100 seniors in an educational psychology class to read a 2500-word passage dealing with the metallurgical properties of plain carbon steel. Previously Ausubel had determined that this topic was generally unfamiliar to undergraduate students in liberal arts and sciences. One group of subjects received an experimental introductory passage, an advance organizer, of approximately 500 words prior to being exposed to the passage on carbon steel. Ausubel describes this organizer passage as follows: "It was designed to serve as an organizing or anchoring focus for the steel material and to relate it to existing cognitive structure, but not to contain information that would provide a direct advantage in answering any of the questions on the steel test." A second group of subjects received an introductory passage which consisted of historically relevant background material on the manufacture of steel. Both groups studied the passage on plain carbon steel for about one-half hour, and three days later took a multiple-choice test over it. Ausubel reported statistically significant differences in mean test scores in favor of the group which had read the advance organizer when compared with the group that had read the historical passage.

A similar study was reported by Kuhn and Novak (1971). The effects of an advance organizer and of an historical passage on the learning and retention resulting from a laboratory experience in biology were compared. The concept being taught was homeostasis. One group was given an 800-word organizer which dealt with the way in which a float in a water tank could be used to regulate and balance the flow of water in and out of the tank by opening or closing an outlet valve. The historical passage given to a second group described a part of the life of Dr. Claude Bernard, involving his work on homeostatic balance. Both groups read the appropriate passage for about fifteen minutes on two different occasions together with the learning passage. A twenty-question multiple choice test was given at the end of the learning session and again after the delay of three weeks. Kuhn and Novak reported that they found no significant differences in the mean test scores for the two groups on the test given immediately after completion of the learning experience, but that there were significant differences in mean test scores for the two groups on the three-week delay condition in favor of the group which had read the advance-organizer passage. They concluded that the results of their study provided support for Ausubel's model of learning and the facilitative effects of advance organizers upon learning and retention.

The study by Ausubel and the one by Kuhn and Novak were discussed in order to illustrate the basic research design used in many advance-organizer studies. In general they are two-group studies in which one group is exposed to an advance organizer followed by a learning passage, while the other, or control group, is exposed to an historical passage followed by a learning passage. In both of the above studies the materials used for the learning passage were meaningful prose materials which were unfamiliar to the students in the experiment. This degree of unfamiliarity was established in both studies by pre-testing the learners on the material. The Kuhn and Novak study examined immediate retention of the material as well as delayed retention. Ausubel examined only delayed retention. In the delayed retention situation, the differences in test scores were in favor of the advance organizer group. Many other studies have supported the finding that organizers have their maximum impact with delayed-retention situations.

There have been a number of reviews critical of the claims of facilitative effects of advance organizers. Ring and Novak (1971), and West and Fensham (1974), have both offered cirticism of advance organizer studies. More recently Barnes and Clawson (1975) presented a review which they summarized by stating, "We must conclude from this review that advance organizers, as presently constructed, generally do not facilitate learning." Barnes and Clawson selected thirty-two different studies of advance organizers and then classified them according to a number of variables, such as ability level of subjects, length of treatment, and grade level of the subjects, in an effort to see if any consistent patterns of results emerged. This was an analysis in which studies were assigned to a category based upon a single variable. In examining the effects of the length of the treatment, which included the delay-in-retention measures, they reported that no clear patterns emerged and that length of treatment was apparently not a critical variable in ascertaining the facilitative effects of advance organizers.

Earlier in this chapter, the effects of ability level upon the facilitative action of advance organizers was discussed. In their review, Barnes and Clawson could identify no significant trends suggesting that advance organizers might be more facilitative with students of one ability level than of another. The same negative conclusion was presented when the studies were classified according to the grade level of the subjects in the study. Barnes and Clawson did note that the majority of studies being reviewed used subjects who were in high school or college, and that only two studies were found which used younger-aged students.

Barnes and Clawson also offered a number of recommendations for the development of further studies which would, hopefully, address some of the issues rasied in their review. They pointed out, for example, that studies should be conducted which involved a delay-in-retention longer than the typical ten-day period, in order to determine if delayed retention was indeed facilitated by advance organizers. They also suggested that studies be done under controlled conditions using learning materials at different levels of the cognitive domain.

As would be expected, there were a number of reactions to the Barnes-and-Clawson findings, both supportive and critical of their conclusions. One of the more carefully-reasoned responses was presented by Lawton and Wanska (1977). After a careful review of Ausubel's theoretical position as presented by Barnes and Clawson and as presented by Ausubel, Lawton and Wanska presented a detailed critique of statements made in the Barnes and Clawson article. They concluded that the major contribution of the Barnes-and-Clawson review was that it demonstrated clearly the confused picture of the status of advance-organizer studies.

Lawton and Wanska took Barnes and Clawson to task for using the single-variable classification approach, claiming that this approach has limited value at best. "For example," they argue, "although a group of studies may be 'similar' in terms of utilizing a written organizer, they may be very diversified in terms of subjects' age or ability level, length of treatment, or subject-matter taught. Nevertheless, the authors treat them as comparable studies." It is clear that Lawton and Wanska feel that this one-variable approach was not only simplistic, but that it was not liekly to yield findings which would contribute in a meaningful manner to our understanding of the function of advance organizers in the facilitation of learning. They make a final comment which indicated that there were variables that Barnes and Clawson might have taken into account, but did not. They concluded that, "Before we ask whether organizers facilitate learning, more definitive and stringent tests of the structure of organizers are required." The attributes of advance organizers have, in fact, received little attention until recently. These attributes, in-so-far as they have been isolated, will be discussed further in the last section of this chapter.

If the variable-by-variable approach to the analysis of the effects of advance organizers does not seem promising, another approach is more promising; that is, to compare advance organizers with other pre-instructional strategies in terms of their effect upon learning and retention. The reader may remember that Ausubel described an advance organizer as being at a higher level of abstraction, generality and inclusiveness than is the material to be learned. Ausubel has also indicated that an advance organizer differs from an overview in that the latter may be presented at the same level of abstractness, generality and inclusiveness as the material to be learned.

In an interesting series of comparisons, Hartley and Davies (1976) analyzed some of the research findings on the role of pretests, behavioral objectives, overviews and advance organizers. They based their article upon the following premise: "In designing and using teaching materials, therefore, a great deal of thought and care is usually given to choosing the best way of preparing students for, and introducing them to, new and unusual situations and knowledge. This is usually accomplished by means of some kind of introductory statement or pre-instructional strategy, which serves to preface the teaching to come...These four preinstructional strategies, unfortunately, have been viewed in isolation from each other, as well as from the type of teaching that they introduce." For those who believe that these four pre-instructional strategies serve essentially the same role in learning, Hartely and Davies counter by saying that "Although pretests, behavioral objectives, overviews, and advance organizers all serve a pre-instructional role, there are essential differences among them in both form and function. These differences reflect different sets of assumptions about learning and teaching. They suggest different theoretical positions rather than variations in style."

Hartley and Davies go on to describe the major characteristics of each of the four pre-instructional strategies and present the research evidence to support the effectiveness and limitations of each strategy. They summarize their findings with the following description: "In this sense, pretests alert, behavioral objectives inform, overviews prepare and advance organizers clarify." In comparing advance organizers to the other three pre-instructional strategies, Hartley and Davies argued that "...advance organizers emphasize context, whereas content is the controlling feature of pretests, behavioral objectives, and usually overviews." This analysis is consistent with the generally accepted view of advance organizers as pre-instructional strategies which do not provide specific content, but instead provide a broad, general frame of reference or anchorage which the student can employ in attempting to understand the material which follows.

The Barnes and Clawson, the Lawton and Wanska, and the Hartley and Davies articles have all focused upon the conditions under which advance organizers are effective in aiding learning and retention. The next two articles to be discussed provide interesting alternative approaches since they, in different ways, focus upon some of the critical aspects of advance organizers. The reader may recall that one of the guiding principles of Ausubel's approach to learning is that the material being learned must be meaningful to the learner. One of the confounding variables in using such meaningful material is the question of how much do the students already know about the topic. Many studies have attempted to control for prior knowledge through the use of learning materials which were in the judgment of the experimenter, unfamiliar to the students. In an interesting attempt to verify Ausubel's belief that subject-matter is learned best when it is presented in a hierarchical manner, Merrill and Stolurow (1966) developed an imaginary science for their learning materials. Their article is of interest not only because it examines a fundamental aspect of Ausubel's theory but also because it, for all practical purposes, used nonsense syllables as the vocabulary for the learning materials. Briefly, the material dealt with the Xenograde System. The students were asked to solve problems dealing with the relationship of microns/alphon, blips and satellites from a prepared table of values. Such values did not exist but were constructed for the purpose of this study. The interesting aspect of this approach is that the terms used were presented in a manner that made the material appear to be potentially meaningful and logical. Its advantage, of course, was that knowledge already existing in the subjects' cognitive structures would not be useful to them in learning this material.

The major purpose of the study was to examine the variable, type of presentation of material. Three approaches were used: The hierarchical organization, a general review procedure and a specific review procedure. Merrill and Stolurow described the purpose of the study as follows: "Based upon Ausubel and Gagne, it was hypothesized that subjects who received a hierarchical presentation would make fewer errors during learning and subsequent testing than would subjects who received a problem-oriented presentation of the same task." Their findings were viewed as being supportive of Ausubel's hierarchical position. They stated, "The results were as follows: "Being presented the summary prior to receiving the problems does **not** take significantly more time than when the summary is not presented, but it **does** increase the number of correct responses during the learning session and on the test."

The learning materials that have been used in most studies of advance organizers have been fairly long and have been presented as a prose passage. Learning passages have varied between 800 and 2,500 words in length and advance organizers have been between 200 and 800 words in length. Rickards (1975) introduced an interesting variation in the use of advance organizers by interspersing a number of 10 to 12 word advance-organizer statements within the material to be learned. In this approach, the subjects receive the advance organizers in short sentences at the same time that they are reading the learning material. This approach is not new. A number of textbooks place questions or problems to be solved periodically throughout the text. The intent is to aid the reader in summarizing and digesting the previous material before continuing. Not only does the reader receive the material to be learned simultaneously with the advance organizer; he is also exposed to a number of advance organizers, rather than just to one, which is the situation in most advance organizer studies.

Rickards added two other variations to his study. Most of the studies of advance organizers have used multiple-choice tests to measure learning and retention. Rickards reasoned that information related to advance organizers might be more easily inferred using a free-recall type of test rather than the multiple-choice format. He also varied the type of interspersed organizers from the most general and inclusive superordinate question to the most specific coordinate statement. A superordinate question required that the reader infer the answer from information provided in the text, while the coordinate statement was a statement of information contained in the text. The results of this study were clear and supported Ausubel's position on advance organizers. Rickards stated, "Of greatest importance was the finding that interspersed advance organizers yielded greater recall of the passage information than did either interspersed post organizers of interspersed coordinate pre-statements or post-statements." What Rickards found was that the superordinate statements yielded greater recall of passage information than did coordinate statements. Ausubel's description of an advance organizer as being more general and inclusive than the material to be learned appears to be supported by this study.

While the previous studies have provided a number of interesting and unique experimental approaches to the study of the effects of advance organizers on learning and retention, a number of studies have examined advance organizers from different theoretical positions. There has been a rise in interest and research in cognitive learning theory, and new modes for analyzing research results have been developed. A number of studies have drawn upon these recent advances to provide the beginnings of an integration of the claims and counter-claims concerning advance organizers.

Glass (1978) proposed a technique involving the "effect-size" statistic for comparing the effects of different experimental treatments across studies. This statistic does not employ the concept of statistical significance, but allows for the analysis and comparison of differences in the effect of experimental treatments regardless of their magnitude. The use of the "effect-size" statistic allows for the identification of consistent treatment effects across a number of unrelated studies of the same phenomenon. Luiten, Ames and Ackerson (1980) employed Glass's "effect-size" statistic to examine the reported findings of approximately 170 studies of advance-organizer effects. Luiten, et al. described their procedure as follows: "In each of the studies analyzed, the most important feature considered was the magnitude of the effect of the advance organizer on learning and retention." They analyzed the findings of some 160 studies which employed different delay times between the presentation of materials and the testing of knowledge of these materials. Of interest is that 110 of these studies employed a delay of one day or less between the learning period and the testing period; Luiten, et al., define these as studies of learning. The remaining studies used delay times ranging from 2 to over 22 days; the authors define these as retention studies.

They reported the following results. "The mean effect-size for the advance organizer on learning would indicate that the average participant receiving the advance organizer treatment performed better than 58% of control-group individuals. A similar statement can be made for the average effect-size at each retention level. Interestingly, the retention-level data shows the advance-organizer effect to increase with time." Luiten, et al. conclude that the advance organizer does indeed have a small but consistent facilitative effect on learning and retention. Further, they pointed out that the effect size of the advance organizer treatment increased across time. These findings are viewed as supporting Ausubel's contention that (a) the advance organizer does have a facilitating effect on learning and retention, and (b) the most effective use of an advance organizer is for facilitating delayed retention rather than for facilitating more immediate retention.

Luiten, et al. also examined the influence of grade level on learning and retention. They identified studies in which students were drawn from colleges, secondary schools, elementary schools, and special education. They reported that for measures of learning, the effect size was greater for college and special-education populations, but for measures of delayed retention, the highest effect-size was found with elementary school populations. While the authors do not speculate on the reasons for such findings, there is a suggestion that the organizing and anchoring effect of the advance organizer may be more pronounced for those students whose cognitive structure is least well-organized.

In an attempt to identify the attributes of an advance organizer, Newell and Olejnik (in press) drew upon Paivio's (1969) work on imagery. Paivio and others had developed normative data concerning the attributes of imagery, concreteness, and meaningfulness for 926 nouns. Paivio argued that for concrete words, the influence of imagery was higher and the words would be remembered longer. Voss and Newell (1977) had developed a 20-item rating scale which identified the reader's perception of the imagery and concreteness values of prose passages. Newell and Olejnik reported a factor analysis of these ratings collected from advance organizer experiments which suggested that the advance organizer, the historical passage, and the learning material could be distinguished from each other using the rating scale. One of the interesting findings was that advance organizers and learning materials were rated almost the same, and historical passages were rated as significantly more abstract than the other two passages. Ausubel's description of an advance organizer as being more abstract than the material to be learned was not confirmed by this study. While the reasons for the differences in ratings is not clear, Newell and Olejnik did demonstrate that prose passages could be rated consistently on the dimensions of abstractness and imagery. While this study developed from an attempt to analyze an advance organizer using a different theoretical position, the demonstration of a stable and consistent rating system to describe the attributes of prose materials was viewed as a contribution to the attempt to describe the attributes of an advance organizer.

The final article to be presented here represents a comprehensive attempt by Mayer (1979) to relate the available research on advance organizers to three theoretical positions on learning and retention. After a brief review of some of the major findings from previous studies, Mayer described the three theoretical positions. The first theory presented by Mayer, Reception Theory, postulates that, "...test performance is a function of the amount of information that is received by the learner." Mayer concluded that "This theory predicts, for example, that if a test measures content from the instructional material, then presenting an organizer before, after, or not at all should have no effect on test performance." If Reception Theory is an appropriate description of learning, then the advance organizer should have no significant effect on learning, since this position focuses only on whether or not the learner received the information presented.

A second theory presented by Mayer is called Addition Theory. According to this position, "...more is learned if the learner possesses the proper prerequisite anchoring concepts." Mayer stated that "This theory predicts that presenting an organizer before learning should result in more learning than presenting the organizer after learning (or not at all), since only in the former case can the organizer provide the needed anchors." This position appears to be consistent with that of Ausubel. It is also supported by research which suggests that organizers presented **after** the learning material do not demonstrate the same degree of facilitation of learning as do organizers presented **before** the learning material. This position suggests that reviews or summaries at the end of a unit will probably have little facilitative effect on learning and retention.

The final theory presented by Mayer is called the Assimilation-Encoding Theory. While this theory is similar in some ways to the Addition Theory, there are additional elements which Mayer beleives make the Assimilation-Encoding position more appropriate. In both the Reception Theory and the Addition Theory, the outcome of learning depends primarily upon how much of the presented material is stored in long-term memory. In the Assimilation-Encoding position, there is an active integration of the new information with existing knowledge, and the outcome of learning varies with the breadth of the learning and not merely with the amount of information received. Mayer then submits these three theoretical positions to a number of experimental tests based upon prior research findings in order to determine their adequacy in predicting the research findings. Mayer summarized this analysis by stating that "These results provide fairly consistent support for the predictions of Assimilation Theory regarding the effects of advance organizers on the outcomes of learning."

Of particular interest to the present topic are the findings presented by Mayer which attempt to define an advance organizer. Mayer cited the following:

1. "...organizers are always relative to the particular learner and subject matter." This conclusion seems to be consistent with the position presented earlier by Ausubel when he cited some of the conditions which would effect the outcomes of using advance organizers in learning.

2. An advance organizer is generally a "Short set of verbal or visual information, presented prior to learning a larger body of to-be-learned information, containing no specific content from the to-be-learned information, providing a means of generating the logical relationships among the elements in the to-be-learned information, and influencing the learner's encoding process." Mayer has restated some of the findings presented from other studies. In addition, he has pointed out that the advance organizer serves functions in addition to merely organizing the new material for the learner. Mayer concludes that the advance organizer also organizes existing knowledge in a way that makes the assimilation of the new material with existing knowledge easier and more effective. Only an Assimilation-Encoding position allows for this orgainzation of already-existing knowledge.

Before presenting a number of attributes which seem to be necessary for an effective advance organizer, a brief summary of the major findings of the research studies presented will be offered, since the research findings are often in conflict with one another, and the theoretical positions assumed by different research studies vary widely. Advance organizers are used in the learning of meaningful material such as the material presented in most classrooms. Advance organizers do not appear to have any significant facilitative effect upon the learning of materials by rote. Advance organizers are effective primarily when they are presented prior to or in advance of the material to be learned, since the role of the organizer is to organize both the material to be learned and the existing knowledge base of the learner. An advance organizer should be a series of superordinate concepts which are more general and inclusive than the material to be learned. This means that overviews or reviews, which are most often presented at the same level of inclusiveness and generality as the material to be learned, will not be as effective in the facilitation of learning as will advance organizers. The issue of whether an advance organizer must be abstract rather than concrete is questionable. Apparently, high-imagery words, regardless of whether or not they are abstract or concrete, facilitate learning and retention.

The variables which determine the overall effectiveness of an advance organizer are multiple and not unitary, so that the ages of the learner, the difficulty of the material and the prior existing knowledge of the learner must all be considered simultaneously in developing an advance organizer. The major reason why an advance organizer is effective is found in its organizing of the material to be learned and not in its relationship to the content of the new material. Organizers should not contain information that is also included in the material to be learned, but should present a general inclusive organizing presentation for the learner. Organizers can be long or short in length and can be used with long passages of learning material or interspersed throughout a prose passage. The more unfamiliar the material is to the learner, the greater the effectiveness of an advance organizer. An advance organizer produces greater measured effects with delayed retention than with immediate retention. Some studies have found that an advance organizer produced no significant effects at all with immediate retention.

DEVELOPING ADVANCE ORGANIZERS

Perhaps the best way to illustrate the development of an advance organizer is to consider an organizer this author uses in teaching an undergraduate course in educational psychology. As the reader will probably realize, these students know little about learning theory. Therefore, the situation is appropriate for the use of an advance organizer. In light of this, an advance organizer is used to introduce a unit on Ausubel illustrating the cognitive approach to learning theory.

The first step in presenting the unit is to explain "subsumption," one of the major principles in Ausubel's theory of learning. This principle describes how new material is related to already-existing material in cognitive structure. There are two major types of subsumption, depending upon whether the new material can be realted directly to what is in cognitive sturcture, or not.

After explaining subsumption to the class, I present what appears to have the effect of an advance organizer. I ask the students to imagine that they have a bowl of Jello, with the Jello cut up into pieces. If they then add additional pieces of Jello from another bowl and stir this combined mixture, very quickly the new Jello will be indistinguishable from the original Jello. Furthermore, what they now have is more Jello, not different Jello; the structure of the original Jello in the bowl has not been modified very much.

I then ask the students to imagine another bowl of pieces of Jello. In this second case, we will add a handful of miniature marshmallows and stir the mixture. A number of things happen. First, even after some initial stirring, the new material (marshmallows) can still be distinguished from the Jello. Second, after the combination has been thoroughly mixed and blended, what we now have in the bowl is different from the original Jello. That is, we have a new combination in the bowl that represents the blending of the Jello and the marshmallows. Students appear able to visualize these two Jello mixings quite easily.

I tell my students to keep these two examples in mind as I proceed. I then point out that in learning, new material can often be related directly to what exists in cognitive structure, in much the same way that the bowl of Jello and the added Jello would combine, without significantly modifying either cognitive structure or the resulting bowl of Jello. This is called "correlative subsumption" by Ausubel.

At other times, the new material to be learned cannot be easily related to what exists in cognitive structure. When the new material (marshmallows) enters cognitive structure (the bowl of Jello), what exists in cognitive structure must be modified in order to accomodate the new material. Once this accommodation has been completed, what exists in cognitive structure is now modified. A new aspect of cognitive structure now exists in much the same way that the blend of marshmallows and Jello is a new mixture. This is called "derivative subsumption." An example of this occurs when the student learns algebra. The result is that the student can now think of the world differently; that is, algebraically and not just in terms of arithmetic.

While the "Jello organizer" certainly lacks elegance and scholarly background, the evidence from the students is that it works. It also reflects some of the fundamental characteristics of an advance organizer. First, it is an attempt to teach the students something that is quite unfamiliar to them and for which they have little in their cognitive structures to which the concept of subsumption can be directly related. The Jello examples are familiar to all of the students. Even though they may not have actually mixed Jello with Jello or Jello with marshmallow, they have had experiences with Jello and with marshmallows, and so can readily imagine what might happen. Second, the Jello organizer contains no specific information related to the process of subsumption. Of that I am certain. The blending of Jello and marshmallows is a rather general and inclusive kind of illustration which could be used to describe a number of different problems. That is, the organizer contains general and inclusive superordinate concepts.

Mayer (1979) has presented a checklist for attempting to determine if you have developed an effective organizer. He prefaces this checklist by indicating that, at present, there is no foolproof way to determine if you are developing an effective organizer. Using the Jello example just presented, let us examine Mayer's checklist. First, "Does the organizer allow one to generate all or some of the logical relationships in the to-be-learned material?" Does the Jello illustration communicate the essential concept that new and existing information can be mixed in at least two ways? If it does, then the Jello example meets this criteria for an effective organizer.

Second, "Does the organizer provide a means of relating unfamiliar material to familiar, existing knowledge?" The Jello illustration most certainly meets the criteria of familiar material. The concepts of correlative and derivative subsumption are generally unfamiliar to undergraduates in educational psychology courses. The Jello organizer then provides the means for relating unfamiliar to familiar material.

Third, "Is the organizer learnable, i.e., is it easy for the particular learner to acquire and use it?" The Jello example is quite simple and deals with materials with which the students are familiar. In addition, the illustration has the potential for being high in imagery, and students can imagine exactly what the Jello-and-marshmallow mixture would look like as it was being mixed.

Fourth, "Would the learner normally fail to use an organizing assimilative set for this material, e.g., due to stress or inexperience?" Undergraduate students in educational psychology have not typically conceived of the acquisition of new material in terms of the subsumptive process as described by Ausubel. The terms used are unfamiliar, and the tendency is for the student to rotely memorize the definitions of the two subsumptive processes without attempting to understand the logical processes being described. The Jello organizer is an attempt to preclude rote memorization of the terms and to provide a way of conceptualizing the subsumptive process by relating it to familiar materials.

Over and above the checklist provided by Mayer, there are other considerations that need to be reviewed. The situation should be examined in order to determine whether or not an advance organizer should be used at all. The advance organizer is only one of a number of effective preinstructional strategies. Throughout all of the research reviewed, the characteristic that the material to be learned be unfamiliar to the learner is cited over and over again. Before considering if an advance organizer should be developed, the instructional designer should have some evidence which suggests that the material being presented is unfamiliar to the learners. This evidence can be derived from a number of different factors: the complexity of the material, the lack of general experience of the learners due to age or educational background, or the level of cognitive development of the learners. Often the best evidence is obtained from teachers who have had consistently poor experiences in teaching a particular concept or topic. Such topics are the best candidates for an advance organizer.

Once the determination has been made that an advance organizer appears to be appropriate, the next step is to identify the central theme or concept in the material to be learned. That is, the teacher or instructional developer must ask, "What is the main point or theme of this unit of instruction?" The advance organizer must focus upon this major theme or concept. Unless this concept is identified clearly, the theme of the organizer may not be appropriate for the material to be learned. There must be a close correlation between the theme of the organizer and the theme of the material to be learned.

Instructional developers very often are interested in the use of media in the presentation of units of instruction. While there are only limited examples of research using non-verbal advance organizers, the media presentation should serve effectively as an advance organizer if it meets the criteria presented earlier. There is a caution which should be observed in the use of media. While visual media appear to be inherently more imagery-producing than verbal or written materials, there is no reason to automatically assume that this is the case. All of us have experienced media presentations which were not very interesting and which did not generate a great deal of imagery. A major criterion for the selection of media for use as an advance organizer is whether or not the media presentation focuses upon the major theme or concept of the material to be learned is not often done well.

The reader needs to be reminded of the work by Rickards (1975) in which he interspersed a number of short advance organizers within the material to be learned. While this procedure has not been reported except in the case of the teaching of reading, an instructional developer should seriously consider this use of an advance organizer. There is some evidence to suggest that in this use, the advance organizers function in two different roles. First, the organizer aids the student in summarizing what has already been read; this is not an advance-organizer role. Second, the interspersed organizer prepares the learner for reading what is to come; this is the advance organizer function. These interspersed organizers often take the form of questions of the prior material. Questions which require the learner to infer the answer from the prior material, rather than questions which elicit facts, appear to serve as advance organizers.

In the development of competency-based instructional programs, the developer often includes unit tests which must be mastered to criterion before the learner can continue. These unit tests, if they include a number of superordinate-level questions, could serve both as a measure of competency and as an advance organizer for the material to be read.

SUMMARY

Advance organizers at best provide a clear anchorage for the learner which assists him in learning unfamiliar material, and, at worst, are pre-instructional strategies which remain popular even though there is only minimal evidence that they facilitate learning and retention. The research available is confusing and unclear as to their value in the facilitation of learning. In this chapter, the major research sutdies and reviews have been summarized in order to give the reader a flavor of the state-of-the-art. While it may not be obvious to the reader, research focusing upon the advance organizer appears consistently in educational journals. While Barnes and Clawson presented a most negative conclusion concerning the facilitative effect of advance organizers upon learning, many of the other critical reviews have concluded that there is evidence that advance organizers do provide a small but consistent facilitative effect upon learning. The actual development of an advance organizer requires time and effort. While there is no evidence to support this hypothesis, the author of this chapter would suggest that the very act of identifying the major theme or concept of material to be presented could provide a focus and organization for the teacher which would result in greater achievement by the learners. Developing advance organizers remains an art rather than a science; there are no clear rules and procedures to follow. The proof of the effectiveness of any advance organizer lies in the achievement gains of the learners. If there is evidence that this gain in achievement occurs, then the material presented as an advance organizer is probably effective.

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C. CLIENT-DEVELOPER RELATIONS

Chapter 21

Psychological Typologies and the Dynamics of Consultant Relationships

William C. Coscarelli
Jerry K. Stonewater

Why does communication break down between instructional developers and clients? These breakdowns are more than likely due to a misunderstanding of the client's characteristics on the part of the developer. This chapter explores the work of Rogers, Johnson, Gibbs and Jung as the basis for a theoretical basis for successful consulting relationships.

"Jerry, I don't know what I'm going to do about her. She really frustrates me."

"Who? Ermalita?"

"Yeah. I can't seem to get anywhere with her. She always seems to be working and working and working but nothing ever really seems to get done. This has gone on for too long now; I think maybe I had better consider terminating the relationship."

"Hmmm. That would be too bad; she seems like a potentially good client."

"I agree, but I just don't know what else to do..."

"Maybe it would be useful to talk some more about her; you might get a suggestion."

....

"So, that's the way the relationship has gone. I'm convinced that she is a potentially good client, but I can't seem to get anything out of her."

"Well, from what you've described you seem to have a good rapport with her. I think you have managed to create an open relationship, but there may be another variable you overlooked."

"What's that?"

"Well, how does she react to you in your conversations--when you ask a question, does she answer it directly or will she sometimes seem to wander all over the place?"

"All over the place, there's no doubt. I've even seen her in the classroom with some of the questions that are raised by students. Somebody asks her a question and it seems that she talks about everything except the question that was raised."

"A classic spontaneous."

"A classic what?"

"From what you have told me you have described two things. The first is that you and Ermalita have a good relationship; it seems to be open and accepting, but it isn't enough for you to have simply maintained that part of the process. You need to think some more about how she makes decisions. That is the part that is probably causing your frustrations. From what you have described she gathers and processes information in a manner that is different from what most of your clients probably use. Her thinking is more likely stream-of-conscious and less likely systematic in nature. If you expect her to react systematically to your suggestions without guiding her in some way you're bound to end up frustrated."

"I see; what you seem to be suggesting is that there are two important conditions in the consulting process, with Ermalita or anyone else; the first is to establish an open and supportive relationship, and the second is to understand the decision-making styles of the client, which you have described in terms of a continuum from spontaneous to systematic behavior."

"Yes, I think that's a fair summary."

This vignette is a composite of several conversations we have had among ourselves and with others. The difficulties one of us had with a client instigated the beginnings of our efforts to understand more clearly the consulting process and the conditions that foster a productive relationship.

As designers, we too often forget to develop our interpersonal relationship with the client and to use this relationship as yet another means for facilitating creative solutions to problems brought to us. We forget in the midst of all of our objectives, task analyses, and experimental designs that the person sitting in the chair opposite us is a human being too--and that the development of the relationship between us may be just as important in facilitating a solution to the problem as are the objectives, task analyses, etc. As Leonard (1979) has pointed out, "Most (consulting) contracts are enhanced or diminished depending on the consultant's interpersonal communication skills. These are the same skills needed by individual therapists: warmth, empathy, positive regard, expressions of feelings, ability to accurately send and receive messages, establish trust, give and receive feedback, handle conflict, and accurately gauge client behavior."

In this chapter, we suggest that there are two conditions necessary for an effective consulting relationship: an open and honest interpersonal relationship between the client and the consultant, and an understanding of the client's decision-making styles. In short, skills for facilitating interpersonal relationships and responding to decision-making styles are ones that a consultant should be able to use along with traditional instructional development skills.

In what follows, we will first discuss models of consulting and the successive stages followed in establishing the consulting relationship. Next we will outline Rogers' presentation of the requisite conditions for interpersonal relationships leading to creative problem solutions; and we will consider Gibb's criteria for nurturing interpersonal development. Finally, drawing from Jungian theory, models of client-decision-making styles are considered as yet another aspect of the interpersonal dimension.

THE CONSULTING PROCESS

Others have explored the definitions and assumptions involved in the consulting process. We will not describe these in depth; however, we will attempt to summarize some of the more relevant points of these discussions.

Definition. The consulting process is essentially "some type of planned intervention into an on-going organizational system" (Davies, 1975). Steele offers the following definition, which focuses upon this basic understanding:

> any form of providing help on the content, process or structure of a task or series of tasks where the consultant is not actually responsible for doing the task itself but is helping those who are. (Steele, 1975)

Further, Steele indicates that the client has the option to reject the help or advice of the consultant at any time.

Based on these definitions, Tilles (1961), Schein (1969, 1978), and others have suggested that there are three general models of consultation: 1) the Project or Purchase model, 2) the Physician/Patient or Prescription model, and 3) the Process model. From Schein (1978), these models can be characterized by the following assumptions. Note the emphasis placed upon the management of the interpersonal relationship or the client's decision-making style.

Product or Purchase Model. In this model the client has decided what is needed to solve a particular problem. It is assumed that the client has chosen the correct consultant or expert to solve the problem, that the client has communicated the problem clearly to the consultant and that the client is prepared to accept the consequences of the consultant's intervention. The client identified the problem and expects the consultant to deliver a solution--the product that is purchased.

Physician/Patient or Prescription Model. In this approach the client experiences some difficulty with the system of interest. Based upon the medical model, the diagnosis and solving of the problem are best done by an expert. It is assumed that the client has correctly interpreted the symptoms of the "sickness," that the client can trust and will accept the diagnostic information, that the "prescription" for the problem will be implemented, and the client will be able to remain healthy after the consultant leaves. In this model the client is dependent upon the consultant for the diagnosis, while the consultant is dependent upon the client for the accurate communication of the symptoms of the problem.

Process Model. Those following this approach hold that for many problems the only way to find a worthwhile solution is for the client and the consultant to work together to generate the solution. Thus for certain situations, it is assumed that the nature of the problem is such that the client will need help in making the problem diagnosis, that the client has problem-solving skills and wants to employ them, that the client is ultimately the one who knows what form of solution is workable. The process model assumes that if the client is involved in the problem-solving process then there will be an increase in her/his problem-solving skills. In this model the client feels responsible for the solution to the problem, and the focus here is upon the processes involving the following problem-solving sequence; the product now becomes secondary to the process.

In each of the above models, task completion was of primary concern, while relationship management or ways of responding to the client's decision-making style are not emphasized. In the Product Model we find that the consultant is barely required to interact with the client. The client may call the consultant and ask that a training package be prepared by a specific date. The only interaction here may be the initial phone call requesting the service or product. In the Prescription Model the client interacts more with the consultant. In this model the human interaction will exist at a level beyond that in the Product Model, but it can be a very limited interaction, with tolerance for a wide range of behaviors on the part of either party, reminding one of a physician exhibiting a "bedside manner." If the problem is severe enough, or if the patient has a great deal of confidence in the physician, s/he often will tolerate a variety of rude bahaviors in order that the body may be cured. If the malady is less critical, one might then select a medical consultation in which the "bedside manner" conforms more closely to the patient's own style or preference. In either case, human interaction plays a role in this model which is peripheral to the problem at hand. In the Process Model, in which interaction is maximal, again no attention is given to either the management of the interpersonal dimension or to the client's decision-making style. But both could have maximal impact with this model.

STAGES OF THE CLIENT-CONSULTANT RELATIONSHIP

Regardless of the consulting model used, there are specific stages in the development of the client-consultant relationship. We will briefly survey these stages with an eye toward the Process model in which these stages are often more apparent and prolonged. Again, however, note the relative absence of emphasis on the interpersonal process.

Most of the work describing the stages of the consulting process focuses on the steps that the consultant will follow during the course of the interaction. Rhodes (1974) observed five sequential stages: the entry phase, in which the consultant begins interaction with the client system; the diagnosis stage, in which the consultant makes an assessment of the characteristics of the client system; a contract phase, in which goals and expectations are formalized; the intervention and consultation maintenance process itself; and finally, the termination of the relationship.

Davies (1975) offers three main stages within which he sees activities occurring. There is an Entering phase, in which the initial contact with the client system is made and the negotiation of a formal relationship is conducted. Next there is the Maintenance phase, in which the problems are analyzed, decisions are made, and a commitment to action is made on the basis of the analysis and decision-making activities. Finally, there are termination activities, during which an evaluation of the intervention is made and the consultant's involvement in the client system is reduced or terminated.

For Kurpius (1978) nine stages characterize the consulting relationship. There is a pre-entry stage in which the consultant is faced with examining his or her own assumptions about the nature of the consulting process; this is followed by an entry phase, in which the first contact is made with the client. Next there is an information-gathering stage, in which the client seeks data for use in the next stage, in which the problem is formulated. From this formulation a problem solution is derived, in terms of specific outcome-statements. Finally, there is the implementation and evaluation of the solution, followed by the termination of the relationship.

None of these authors would argue that each of these stages must necessarily follow in a direct line or sequence. Indeed, most feel that there will always be some kind of interaction or overlap among the stages. What we feel is important here is that all of the stages described above refer more to the task orientation of the relationship rather than to the interpersonal characteristics of the relationship. While none of these authors would deny the importance of the interpersonal aspects of the relationship, their stages do not directly reflect the interpersonal skills that must be brought to bear in the relationship.

At this point we have discussed the relative lack of attention which has been given to the interpersonal relationship between the client and the consultant in the consulting relationship. We would now like to set forth the theoretical arguments that support our first thesis; i.e., that open and honest communication between the client and the consultant increases the probability of the emergence of a creative solution to the problem under consideration. The theories of both Rogers and Gibb will be used to show how the consultant can establish an open and honest environment which can, in turn, nurture creativity.

OPEN AND HONEST COMMUNICATION

The problem of openness and honesty with respect to what one is willing to share has been represented by the Johari Window (Luft, 1961). In this model we are represented by a wall containing a window of variable size. Our mind is on one side of the wall, and the person we are communicating with is located on the other side. Others can only receive information from or about us if this information is displayed, either intentionally or unintentionally, in the window. This display function can be represented, then, by describing the size and opacity of the window. This window is said to vary in size for different kinds of information, in different settings, and when communicating to different individuals or groups. And it is said to take on four different states, or conditions: Open, Concealed, Blind, and Unknown.

The 'Open' pane of the window displays the information that we are willing to share with others. This window may be larger or smaller, depending upon who we are communicating with; it provides the basis for most of our communications with others. The 'Concealed' pane holds those pieces of information that you as a communicator do not wish to share with another. Some things that remain concealed in one interaction may not be so concealed in another. In the 'Blind' pane we find information that other people perceive about an individual but which that individual is unaware of. For example, you may perceive yourself as fair in dealings with subordinates, while others may perceive you as vindictive. With the 'Unknown' pane we come to that information which is unperceived both by the individual and by others. This pane includes all the things one is potentially, but which have not been discovered by oneself or by others. Figure 21-1 represents these relationships. Using the Johari Window, Schein (1969) has characterized four types of communication patterns between two persons (See Figure 21-2).

Arrow A represents the normal mode of communication between two people, i.e., both parties sharing information that is known to themselves and which they are willing to share. Arrow B represents a situation in which information is gained from the other party which they did not intend to transmit. Arrow C represents a situation in which a party has begun the process of self-disclosure, i.e., sharing information that is not normally shared. Arrow D represents a situation in which neither party is aware of the messages being sent or received, a situation which most likely results in a sense of tension between the parties, or conversely, of attraction. As consultants we feel that we must be aware of the types of messages which exist in the communication process. These messages can come to us through verbal or non-verbal means; and if ignored they can have a deleterious effect upon the consulting relationship.

What we contend is that these messages between client and consultant should be as open as possible, and that when this situation is reached there exists the highest probability that the interpersonal relationship will be fruitful and that the

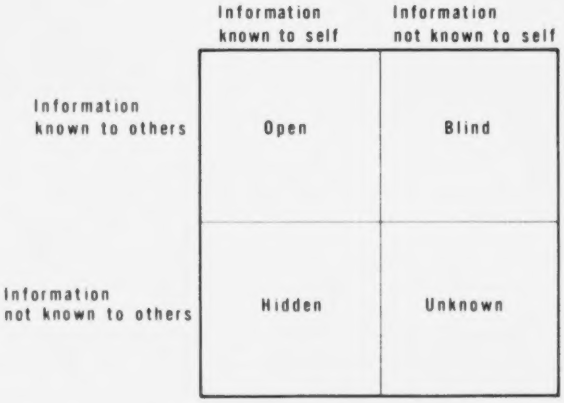
Information known to self
Information not known to self
Information known to others
Open
Blind
Information not known to others
Hidden
Unknown

Figure 21-1. The Johari Window. (Adapted from Understanding Interpersonal Communication, Richard Weaver, p.64).

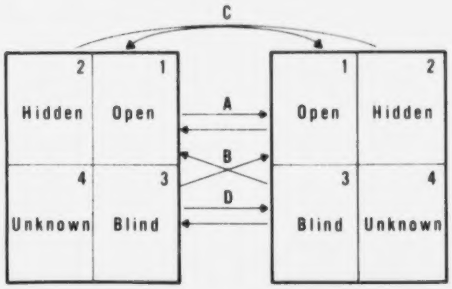

**Figure 21-2. Types messages in a two-person communication situation.
(Adapted from Process Consulatation: Its Role in Organizational development, Edgar Schein, p.24).**

solutions to the instructional problems will be as creative as possible. The goal, then, for the interpersonal relationship should be the development, by the client and consultant, of the Johari window with the widest possible open pane. See Figure 21-3.

We believe that this goal represents a necessary condition for the achievement of that consultation situation which is most conducive to the creative solution of problems. In the next two sections we will attempt to outline the theoretical basis for this argument.

CONDITIONS NECESSARY FOR THE CONSULTING RELATIONSHIP

> The farmer cannot make the germ develop and sprout from the seed; he can only supply the nurturing conditions which will permit the seed to develop its own potentialities. (Rogers, 1961)

The product of the consulting relationship (and here we mean tangential products as well as the services provided) should be the most creative solution to the problem at hand. Creative, in this sense, can be defined as:

> the emergence in action of a novel relational product, growing out of the uniqueness of the individual on the one hand, and the materials, events, people, or [one's] life on the other hand. (Rogers, 1961)

Our argument that a creative solution can be a product of an open and honest relationship is based upon the assumption that humans tend to actualize themselves. As Rogers put it, "The mainspring of creativity appears to be the same tendency we discover so deeply as the curative force in psychotherapy--man's tendency to actualize himself, to become his potentialities." Further, it is one's "urge to expand, extend, develop, mature--the tendency to express and activate all the capacities of the organism or the self" (Rogers, 1961). It is from Rogers' experience that we wish to establish the conditions which are necessary for the consulting relationship to function properly.

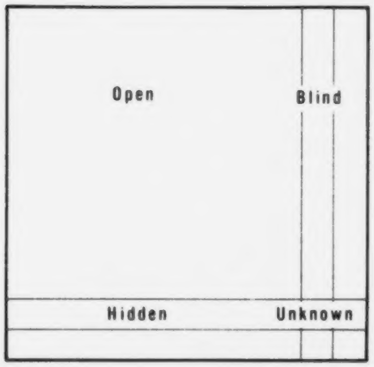

Figure 21-3. A nearly maximal Johari window.

The Conditions for Creativity

According to Rogers (1961) the conditions for creativity can be classified as those that provide psychological safety and those that provide psychological freedom.

Psychological Safety. Psychological safety is the establishment of an interpersonal environment within which the client and the consultant have freed themselves of the defenses that one often uses to protect one's ego. Weaver (1978) has concluded that "humans spend an incredible amount of energy trying to avoid becoming known by other human beings." The same energy that goes into protecting oneself can also be channeled into the creative process when one no longer feels it is necessary to keep defenses up.

In order to establish the condition of psychological safety one needs to accept individuals as possessing a worth in and of themselves:

> Whenever a teacher, parent, therapist, or other person with a facilitating function feels basically that this individual is of worth in his own right and in his own unfolding, he is fostering creativity. This attitude can probably be genuine only when the teacher, parent, etc., senses the potentialities of the individual and thus is able to have an unconditional faith in him, no matter what his present state. (Rogers, 1961)

Rogers notes that this attitude of unconditional worth fosters a belief which causes the individual to sense a climate of safety. The individual learns that it is possible to be whatever s/he is, without fear, knowing that s/he will be accepted. There will be no need for rigidity; thus self-actualization can begin.

It is also necessary to establish a climate in which external evaluation of the client is absent. Evaluation is always a threat and carries with it a need for defensiveness. Indeed, Rogers observed, "I would like to propose...that the major barrier to mutual interpersonal communication is our very natural tendency to judge, to evaluate, to approve or disapprove, the statements of the other person..." This is not to say that to cease evaluating another is to cease having reactions. It may, as a matter of fact, free one to react. "I don't like your idea" (or painting, or invention, or writing), is not an evaluation, but a reaction. It is subtly but sharply different from a judgment which says, "What you are doing is bad (or good)," assigning this quality to you from some external source. The first statement permits the individual to maintain his own locus of evaluation. It holds the possibility that I am unable to appreciate something which is actually very good. The second statement, whether it praises or condemns, tends to put the person at the mercy of the outside force. He is being told that he cannot simply ask himself whether this product is a valid expression of himself; he must be concerned with what others think. He is being led away from creativity.

It is also necessary to be able to understand empathically. Empathic understanding enables one to see what the other is doing and/or feeling, to view the world as the other views it. In this climate the whole self can be freed to participate in the communication process. Further, the "empathic approach leads to improved communication, to greater acceptance of others and by others, and to attitudes which are more positive and more problem-solving in nature" (Rogers, 1961).

Psychological Freedom. Along with psychological safety we must also foster Psychological Freedom; an opportunity for the individual to have complete freedom of symbolic expression. This freedom gives individuals the opportunity to think, feel, or "to be" whatever is within themselves. The individual will be as free to be afraid of failure or of making mistakes as s/he is free to have success.

It is important here that we clarify an impression that may be forming in the reader's mind (empathic thinking?)--**we are not advocating therapy as the basis for the client-consultant relationship.** We accept Schein's (1978) position that

> Interpersonal events should only be dealt with if and when the client indicates a genuine readiness to deal with them and if there is clear evidence that the interpersonal events are getting in the way of effective problem solving. It is not helpful to a client to be pushed into interpersonal and emotional issues before there is an emotional readiness to deal with them.

However, we do believe that establishing an environment of psychological freedom and safety will often bring with it interpersonal issues that stand in the way of the creative process. We should be prepared to recognize these issues when they appear and to cope with them appropriately. For example, having established an open environment for a client, we may find that the client's lack of progress is due to a personal dissatisfaction with her or his career; if the consultant has fostered the conditions of psychological safety and freedom, then these issues will be brought to the fore. It may be that the lack of progress in the relationship is a symptom of a motivational problem the client has in her or his own life. When these issues come out, the consultant may realize that satisfactory progress in the relationship will come only when the client has begun to cope with the dysfunctional themes in her or his life. At this stage the client and consultant together might consider the addition of a trained counselor to the consulting process.

We recognize the complications inherent in establishing the open relationship, but we feel that the potential benefits far outweigh the possible disadvantages of, for example, a project being redirected because of another's personal concerns. We feel that it is our responsibility as consultants to do as much as possible to insure that an open environment does exist, and to be prepared to work with the consequences of this openness. However, the problem of establishing this openness remains.

While there are a variety of ways to think about implementation of these conditions, we have found the work of Jack Gibb, on the process of defensive communication, to represent a pleasant balance between theoretical rigor and practical application.

Defensive Communication. Gibb (1961) has characterized defensive behavior as:

> That behavior which occurs when an individual perceives threat or anticipates threat...The person who behaves defensively...devotes an appreciable portion of (his/her) energy to defending (him/herself)... Defensive arousal prevents the listener from concentrating upon the message. Not only do defensive communicators send off multiple value, motive, and affect cues, but also defensive recipients distort what they receive. As a person becomes more and more defensive, (he/she becomes less and less able to perceive accurately the motives, the values, and the emotions of the sender...The converse, receivers become better able to concentrate upon the structure, the content, and the cognitive meanings of the message. (p. 141-142)

From this, we believe that Gibb's work can provide a framework for establishing the conditions necessary for the success of the consulting process.

Following an eight-year study in which he analyzed recordings of discussions in a variety of settings, Gibb concluded that there were six categories of behavior that worked to provide either a supportive or a defensive climate. (See Figure 21-4). These are described in the following material.

Evaluation Versus Description. Any behavior that is perceived as judgmental of the listener is classified as evaluative behavior. If the receiver senses that the speaker is being evaluative, then the receiver will become wary of the speaker's intent. As Gibb notes, "Because our attitudes toward other persons are frequently, and often necessarily, evaluative, expressions which the defensive person will regard as nonjudgmental are hard to frame. Even the simplest question usually conveys the answer that the sender wishes, or implies the response that would fit into (the sen-

Defensive Climates	Supportive Climates
1. Evaluation	1. Description
2. Control	2. Problem orientation
3. Strategy	3. Spontaneity
4. Neutrality	4. Empathy
5. Superiority	5. Equality
6. Certainty	6. Provisionalism

Figure 21-4. Defensive and supportive climates, (Reprinted from Defensive Communication, The Journal of Communication, 11(3), 1961.)

der's) value system." Descriptive speech will not arouse defensive behavior. Speech that the receiver perceives as having a natural effect or that indicates an honest request for information will help to establish a supportive climate.

Control Versus Problem Orientation. Messages which are sent in order to manipulate the receiver will also produce defensive behavior. This norm in our lives is one of controlling messages, e.g., advertisement and political stands. "Implicit in all attempts to alter another person is the assumption by the change agent that the person to be altered is inadequate; that the speaker secretly views the listener as ignorant, unable to make (their) own decision, uninformed, immature, unwise or possessed of wrong or inadequate attitudes..." A problem orientation is that environment which is established when the sender indicates a desire to cooperate with the receiver in seeking a solution to the problem at hand. It implies no predetermined solution, attitude or method to be imposed upon the receiver.

Strategy Versus Spontaneity. If the sender is perceived as having an end-product in mind which the receiver is being deceived into accepting, a negative climate will also emerge. "A large part of the adverse reaction to much of the so-called human relations training is a feeling against what are perceived as gimmicks to fool or to 'involve' people, to make a person think (they) are making (their) own decision, or to make the listener feel that the sender is genuinely interested in (the receiver) as a person." Spontaneity, on the other hand, will support the interpersonal climate. If the sender is perceived as being forthright and honest, of relating spontaneously to a situation, then there will be a minimal defensive reaction.

Neutrality Versus Empathy. By neutrality we mean speech with affect that is communicating "little warmth or caring." The idea of neutrality here is that the communicator has no regard for the value of the listener. Another instance is an attitude that conveys empathy for the feelings and respect for the worth of the listener.

> Abortive efforts to deny the legitimacy of the receiver's emotions by assuring the receiver that (they) need not feel bad, that (they) should not feel rejected, or that (they are) overly anxious, though often intended to be support-giving, may impress the listener as lack of acceptance.

Equality is thus attained when the sender is perceived as willing to enter into participative planning with "mutual trust and respect."

Certainty Versus Provisionalism. Those who always appear to "know the answers, to require no additional data, and to regard themselves as teachers rather than co-workers tend to put others on guard." The person who operates from the position of certainty will be perceived as "wanting to win an argument rather than solve a problem." The defensive climate is thus reduced when one communicates the sense of provisionalism; a feeling that no issues have been solved in advance, that exploration is necessary for the ultimate solution.

It is with this perspective that we end our discussion of the conditions necessary for the consulting process to function successfully. We have argued that one needs to establish conditions of psychological safety and freedom in order to nurture the creative process. The creation of an "open window" in the sender and the receiver of a message will lead to the most creative solution to a problem. To foster this openness we have adopted the work of Gibb in his analysis of communication patterns and offer these as the characteristics of the conditions of psychological freedom and safety. This thus establishes the necessary interpersonal dimensions of the consulting process. Figure 21-5 represents this pattern of communication. In the next section we will focus upon what we perceive to be the additional conditions of the consulting process. There we will focus upon patterns of thought that are more directly related to the cognitive patterns of decision-making.

ADDITIONAL CONDITIONS IN THE CONSULTING PROCESS

In the previous sections we were concerned with establishing the conditions that will allow those involved in the consulting process to operate

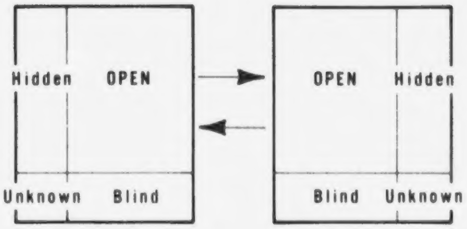

Figure 21-5. Optimal communication pattern between sender and receiver.

as creatively and as freely as possible. In this section we will look more at those conditions which help the consultant to understand how the client thinks in the process of the problem-solving exercises. Whereas the necessary conditions of the consulting process are focused more upon the interpersonal dimension of the relationship, the conditions to be discussed here focus more upon cognitive areas of interaction.

Filters

In Figure 21-5 we diagrammed the optimal Johari window for the creative process. In this figure we represented communication as arrows between the open panes of the windows. The further conditions of the consulting relationship now revolve around understanding more clearly the filters that can intercede between the client and the consultant, through which these arrows must pass. These can be as broad as major personality constructs or as limited in scope as a single cognitive style. Our intention here is to concentrate upon one aspect of this filtering process--that of decision-making styles. We have selected this perspective as it seems to be the most practical one for use in the consulting process. The broad notions of id, ego, collective unconscious, etc., are too general to be of practical assistance to the consultant. The more specific dimensions of cognitive style, e.g., scanning-focussing, field dependence-independence, etc., are often too limited in their practical application to be of help in the consulting process. From both pragmatic and theoretical viewpoints, we have found that the filtering processes used in making decisions and responding to events is an appropriate focus for the consultant. It would appear that decision-making characteristics are relatively stable personality traits that are readily identified in the interpersonal situation.

MODELS OF DECISION-MAKING

Decision-making style refers to the manner in which an individual perceives and responds to a set of information that must be evaluated in some manner. What is important is that these styles follow from a tradition of psychological research and theory and represent more than armchair theorizing. Indeed, much of the theory of decision-making can be explained in terms of Jung's work on the structure of the personality.

Jung (1981) claims that there are four psychological functions of personality: thinking, feeling, sensing, and intuiting. Each individual personality has developed each of the four functions to a greater or lesser extent. In other words, one of the functions dominates the other three. Although the fully-developed personality is impossible, according to Jung, the personality strives toward full development as a goal.

The thinking function is strictly cognitive in that it deals only with ideas and thoughts. The major goal of the thinking function is to comprehend the world and oneself. Thus, someone who must reach a decision concerning which instructional strategy to use in the classroom would focus upon the theoretical underpinnings of the various options, and would probably think about the research studies which have been conducted concerning each. The feeling function, on the other hand, is the evaluation function, in that the value of things is assessed and the emotional reaction to them is formulated. Thus the same client, when deciding upon an instructional strategy, would respond to each possible strategy on the basis of how s/he felt about it. If self-paced instruction left the client feeling overwhelmed and out of control, then these feelings would prevail in reaching a decision not to use this approach, regardless of what the research said about results.

The sensing function is the "reality" function, and yields concrete and observable facts about the world or object of perception. The sensing personality thrives on collecting information and facts. After gathering information concerning the various instructional strategies, this person would be able to recite a great deal of information about each; such information would, in turn be used to guide the decision-making process.

Finally, the intuitive perceiver relies upon subliminal communication and unconscious processes as channels for gathering information. There is a tendency to go beyond facts, feelings, and ideas in order to come to know what is real. Thus, in making the same decision about which instructional strategy to select, the intuitive personality would reach a decision based upon reactions that perhaps could not be carefully specified. They suddenly just "know" what approach they want to use.

Other, less global, approaches have been suggested which concentrate more upon the decision-making styles found among individuals, but without attempting to provide the theoretical underpinnings which Jung has posited. However, these approaches draw strongly upon the Jungian perspective.

Harren (1979) has proposed a model of career decision-making that attempts to explicate the stages one goes through in selecting a career. He proposes a series of invariant stages through which most all students will progress in making their career decisions; he also postulates that the manner in which one responds to a decision-making task can be classified. Drawing from the work of Dinklage (1967), who proposed eight styles of decision-making in the career development process (planning, intuitive, compliant, fatalistic, impulsive, delaying, agonizing, and paralytic), Harren proposed three groups, or clusters of categories. He proposed that decision-making styles were generally rational, intuitive, or dependent. These styles are briefly described as follows:

> **Rational.** This style is characterized by the ability to recognize the consequences of earlier decisions for later decisions. It requires an extended time perspective in which several sequential decisions are viewed as a means-end chain. The individual anticipates the need to make decisions in the future and prepares for them by seeking information about self and the anticipated situation. The individual's decisions are carried through deliberately and logically. The rational dimension is most closely aligned to Jung's thinking dimension.
>
> **Intuitive.** As in the rational style, the intuitive decision-maker accepts responsibility for decision-making. The intuitive style, however, involves little anticipation of the future, information-seeking behavior or logical weighing of factors. Rather, it is characterized by the use of fantasy, attention to present feelings and an emotional self-awareness as the basis for decision-making. Commitment to a course of action is reached relatively quickly, and its basic "rightness" is felt internally. Often the individual cannot state explicitly how he or she decided. This style is like Jung's feeling dimension.
>
> **Dependent.** Unlike rational and intuitive styles, the dependent style is characterized by a denial of personal responsibility for decision-making and a projection of that responsibility outside of self. The individual is heavily influenced by the expectations and desires authorities and peers have of him or her. One tends to be passive and compliant, to have a high need for social approval and to perceive the environment as providing restricted or limited options. Jung does not describe a dimension congruent to this one. (Harren, 1979).

These styles are not restricted to the career-choice process. As decision-making styles they will also be found in other matters involving non-trivial choices.

McKinney and Keen (1974) sampled Harvard MBA students in an attempt to determine what styles managers bring to bear in decision-making tasks. Their model is based "on the dual premise that consistent modes of thought develop through training and experience and that these modes can be classified along two dimensions, information gathering and information evaluation." Information gathering is the stage in which stimuli associated with the decision-making task are perceived and organized. Information evaluation refers to the manner in which the stimuli gathered are processed in light of the decision-making task. Each of these two dimensions are orthogonal in nature, and the polar extremes are defined by the following four decision-making styles:

Information Gathering

> **Perceptive** individuals bring to bear concepts in order to filter data; they focus upon relationships between items and look for deviations from or conformaties with their expectations. Their percepts act as cues for both gathering and cataloging the data they find. As this is a logical and cognitively based approach, it is most similar to Jung's sensing function and its dependence upon detailed information.

Information Evaluation

> **Systematic** individuals tend to approach a problem by structuring it in terms of some method which, if followed through, leads to a likely solution. This is similar to Jung's thinking type.
>
> **Intuitive** thinkers usually avoid committing themselves in this way. Their strategy is more one of solution-testing and trial-and-error. They are much more willing to jump from one method to another, to discard information, and to be sensitive to cues that they may be able to identify verbally, which relates this dimension to Jung's intuitive style and its dependence upon the unconscious.

Working in the interpersonal setting, Johnson (1978) has theorized the existence of decision-making constructs which have drawn upon Jungian theory, and which closely parallel the work of Harren and of McKinney and Keen. Johnson's model also posits a set of two orthogonal factors in the decision-making process: a data-gathering stage and an information-processing stage.

Data Gathering

Spontaneous individuals react to events in a holistic manner. They will commit themselves quickly to new ideas and personalize the commitment. They are willing to change their commitment readily. Their goal orientation is very flexible and their thought process often seem to follow a stream-of-consciousness processes which makes the spontaneous style similar to Jung's intuitive mode.

Information Processing

External analyzers need to think out loud in order to process information they have gathered. It is not just a preference to talk out loud, it is a need to hear the words as they are spoken.

Internal analyzers will process information best if left alone "to think about it." They retreat into themselves to analyze the problem, and find solitude conducive to deciding.

Each of these models makes its unique contribution to the understanding of the decision-making process, as well as reinforcing similar constructs. One sees that Harren's Rational Decision-maker is similar to Johnson's Systematic, is similar to McKinney and Keen's Systematic, all of which can be seen to flow from the Thinking Function of Jung. Similar parallels follow for the other styles as well. It is beyond the scope of this chapter to explore these commonalities, for that is an empirical and theoretical task. However, as a device through which to understand the more cognitive types of filters that we must deal with in the consulting process, we wish to explore more closely the work of Johnson and its implications for the consulting process. We have chosen to focus upon these constructs because they seem to lie in a useful middle ground between the generalities of needs states and the specifics of a singular cognitive style. Additionally, because the behaviors associated with Johnson's constructs are easily observed and classified, they seem especially applicable to the consulting situation (Coscarelli and Stonewater, 1979). In the next section we will examine each of Johnson's four decision-making styles in greater detail.

Decision-Making Styles

Spontaneous Style

There are three main characteristics of the spontaneous style:

1. **Reaction to Events.** The first characteristic is that spontaneous clients tend to react holistically to events. They react to a total experience, as opposed to breaking the experience into its component parts and reacting to each part separately. They either tend to like something or dislike it **in toto.** If asked what she thought about the instructional design process, the spontaneous client would say "great," "phenomenal," or "useless," rather than reacting to particualr components of the process, such as objectives, task analysis, or evaluation. The spontaneous individual is likely to react to the holistic sum-of-all-the-parts rather than to individual parts of the experience. The spontaneous client can react to and analyze component-parts of an experience, but s/he is not likely to do so unless asked to. Initial reactions to an experience or idea will usually be holistic.

2. **Commitment to New Ideas.** A second characteristic of the spontaneous style is a quick psychological commitment to experiences, whether they are concrete (persons and events) or abstract (ideas and emotions). Spontaneous individuals personalize alternatives in order to evaluate them. By internally committing themselves to an alternative, they are best able to determine whether or not they like it. This internal commitment usually results in excitement about new thoughts, ideas, or people. A spontaneous person who first encounters the application of task analysis in the instructional process might get excited about this technique and feel that it is the best thing to happen to instruction. This excitement is the way spontaneous clients have of determining whether or not they like this approach to organizing instruction. However, spontaneous clients can just as quickly change their minds about the value of task analysis when presented with another new approach. The person is not "wishy-washy"; it is simply a way of determining feelings about an idea. This quick, internal commitment is a characteristic of life-style in general, though the spontaneous person is quite capable of being cautious about actions and commitments when s/he perceives the need to be.

3. **Goal Orientation.** A third characteristic of the spontaneous style is a flexible goal orientation. The spontaneous person will move from goal to goal, thought to thought, idea to idea, barely noticing the movement. The client experiences a thought-chaining process that, when carried to its extreme, represents a stream-of-consciousness flow of ideas. This person will often begin a conversation on one topic and end up talking about a completely different and unrelated topic in a short time. The client will generally be able to gather a great deal of information in a short period of time, but will do so in an unstructured fashion. Because of their chaining of thought processes, spontaneous clients are comfortable with sudden changes in their work and will often show a need for a high variety of tasks.

Systematic Style

There are also three main characteristics that describe a systematic style in clients:

1. **Reaction to Events.** A systematic person will have independent reactions to each of the separate aspects of an event. These individuals tend to break down an experience into its component parts and react to each component separately. The systematic client would indicate having

trouble in teaching by outlining the troublesome areas: "My lectures are good and hold the students' attention, the assignments are poorly organized and I need some help there, as well as with my test design." (The spontaneous person might say, "I need some help with my course--it's not going as well as I'd like.") Only after examining each separate aspect of the experience will the systematic person offer a summary of the experience. These individuals need detailed information about an idea before they experience it. They will likely ask the designer many questions about the design process and the tasks they will have to perform before they decide to begin a project. The need for obtaining a detailed understanding is necessary before a systematic individual is comfortable with a project.

2. **Commitment to New Ideas.** Systematic people will also be cautious in making a psychological commitment. They will evaluate each alternative and only personalize the one finally selected. They may, for example, ask detailed questions about the differences between an information-processing approach to task analysis and a hierarchical one before selecting the approach they want to use. One approach may seem reasonable or desirable to them, but they will not choose until they have weighed the evidence. Both the spontaneous and the systematic client may gather a great deal of data before acting, but spontaneous persons will commit themselves to an addition very quickly, and then gather more data to further evaluate the chosen approach. The systematic client will not make a psychological commitment until all data are gathered and analyzed. Once the systematic person has made a commitment, however, a great deal of data is required to change this commitment.

3. **Goal Orientation.** Finally, systematic people are very methodical in goal orientation. They move from thought to thought and idea to idea in a very deliberate fashion. They will be very aware of the goals they set and of movement from one goal to the other. If necessary, they can be flexible and change their plans. They will want to establish new goals for these new plans. They tend to establish long-range goals and work deliberately toward them.

Data Analysis

Once clients have gathered the information about a particular topic, they need to process that information in order to reach some judgment about its worth. Individuals often present two different styles for dealing with the gathered information: internal and external processing.

External Style

External processors are quickly identified by a preference, indeed a need, to think out loud. They are never certain how they feel about an idea or experience until they talk about it. If you ask them to do something they have not thought about before, they are likely to say, "Let's talk about it," or, just as likely, begin a discourse on its pros and cons in order to discover how they feel. Every complex decision will require a good deal of discussion before it is resolved. The external processor needs to hear the words in order to make sense out of them. They will often think and talk simultaneously. For the external, thinking becomes clear when they think **and** talk at the same time. (Not all externals are high verbalizers--some are quiet and will talk only when something is important.) The best way to determine whether or not someone is an external processor is to listen to what they say, and not to how much they talk. Invariably, they will be thinking out loud.

Internal Style

Internal processors will want to think about things before talking about them. If you ask them a question they have not thought about before, there is liable to be a long pause before they answer, or they will request time to "thing about it first." They are likely to be confused or irritated about an issue if they have to discuss it before they have thought it out privately. Internals can be high or low verbalizers--again the key is to listen to what they talk about. Internals will generally talk only about things they have already thought through.

Decision-Making Styles

To the extent that we can define decision-making as the gathering of information and its subsequent analysis, the designer can begin to identify four decision-making styles that are a function of the two types of information gathering styles interacting with the two processing styles. Data gathering and data processing are two independent processes. An individual's style of gathering information does not affect the style with which the information is analyzed, for these are independent events. Figure 21-6 will aid in visualizing this relationship.

It is critical to note that individuals, regardless of their psychological style, can adapt and use behaviors that tend to be associated with another style. For example, spontaneous individuals can adapt to the requirements of certain situations, e.g., work, by setting goals and working at them in what appears to be a systematic fashion. Internals who feel comfortable with their environment can adopt an external behavior, and think and talk simultaneously, whereas an external who is faced with a serious problem may spend hours in deep thought. In both cases, the adaptations will not bring about great clarity. Internals understand best when thinking, externals when talking.

FUTURE DIRECTIONS

When we distill the previous information concerning consulting styles, stages in relationship

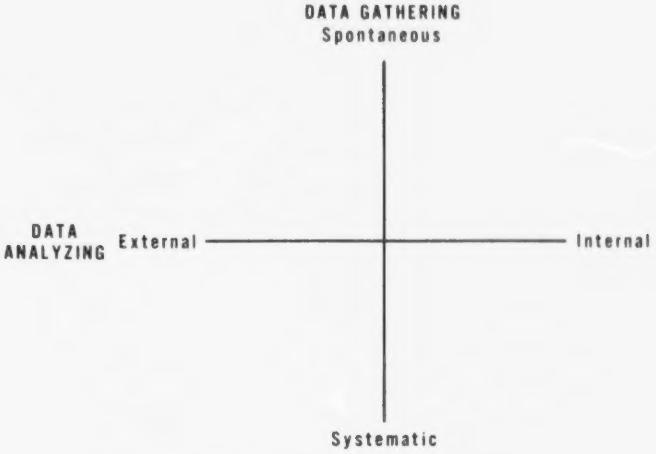

Figure 21-6. The four psychological types.

management, the Johari window, Rogers' theory of creativity, etc., some major considerations for use in instructional development consultation are apparent: Instructional development consultants must be trained to deal with the interpersonal and decision-making dimensions of people with whom they deal. To our knowledge, very little training in this area, either in graduate programs or inservice education, is occurring. As a case in point, one of the authors of this chapter found that during his graduate training, when he requested permission to do some work on the application of interpersonal communication theory to instructional development, he was met with blank stares. This is not to say that graduate training programs in instructional development are inadequate, but rather to say that they must begin to recognize the importance of the interpersonal and personality dimensions in consulting.

People like Rogers and Gibb have much to offer instructional development graduate programs in training for consultation. We would suggest that such training include skills in empathy, effective listening, paraphrasing, confrontation skills and the appropriate use of them, redirection-of-conversation skills, how to use body language, and skills in how to communicate genuinely, as well as skills at identifying decision-making styles.

Two training models--one for interpersonal skills and one for the identification of decision-making style--should be mentioned. First, Savage (1975) trained instructional development graduate students to respond more empathically to clients. He builds the rationale for training empathy skills on the basis of Rogers and Shoemaker's (1971) argument that the change agent's success lies in part with abilities to enter into empathic relationships with clients. The treatment used was Kagan's interpersonal-process by recall method (1972), which involves three major stages. First, subjects listened to a lecture-demonstration of selected interviewing skills. These were portrayed by a client and by a consultant and were used to teach the subjects to differentiate consultant responses which are exploratory/non-exploratory, affective/cognitive, listening/non-listening, honest-labeling/distorting.

During the second phase of the treatment, subjects saw vignettes of clients and were asked to respond as a consultant to them. Both the subject and the vignettes were videotaped, so that the subject could watch the video as an aid in recalling reactions to the material. A trained recall person was used to facilitate these reactions.

In the third part of the training a client and a consultant were given an instructional development situation to role play, and were videotaped. Again, a specially trained recall person was used to help the consultant to review the videotape in order to recall feelings, emotions and reactions to the clients, and to self-evaluate responses to the client to determine whether or not they are empathic.

Savage reports that this treatment did increase the empathic understanding of the consultant for instructional development clients. Details of the research design can be found in Savage (1975).

The second training model is that of Stone water and Coscarelli. The method is used to train people to identify the various decision-making styles described in Johnson's model. First, subjects are given a questionnaire to assess their decision-making style; then they read a description of the decision-making inventory to provide them with background information. Following this, subjects form triads and are asked to identify their own style and that of the others in their group. During the triads, subjects are given the results of the questionnaire so that they can compare their assessment of their style with that of the instrument. The triads function to help the participants become accurate at assessing others' styles because discrepancies between one's own assessment and that of another member of the triad or of the instrument must be resolved. This is usually accomplished by referring to the article describing the styles.

Subjects are then shown a videotape exemplifying each of the four styles. The videotape includes four vignettes, one for each style. The situation portrayed involves a client and a consultant discussing an instructional development problem. After the viewing and discussion of the vignettes, each person has a chance to role-play both the consultant and the client roles in an instructional development-type situation. In this exercise, the client is programmed to use a particular style, but the consultant is unaware of what style the client is using. Thus, the consultant must figure out the client's style and must begin developing ways of responding to each of the four styles.

Following these activities, the workshop moves into discussions of ways in which to respond to the various types of clients. The presenters role-play client-consultant interactions in order to demonstrate various approaches to each type of client.

Participant responses to this workshop have been positive. They easily see the usefulness of being able to identify a client's style and develop response-patterns to each type which are facilitative rather than non-facilitative. Participants usually have had experience with a whole storehouse of clients that fall into each of the four types and are eager to discuss ways of dealing with problem-clients.

SUMMARY

The difficulties with Ermalita that we mentioned in the beginning of the chapter were the impetus for an exploration of the consulting process. Lack of progress in the relationship was due in large part to the consultant's misunderstanding of her individual characteristics. From this experience we began to see that one needs to take an approach which will foster creativity as well as control decision-making styles that can be dysfunctional to the tasks at hand.

We have argued that the theoretical basis for a successful consulting relationship can be found in applying the work of Rogers and of Johnson. Rogers has laid the foundation for the development of quality relationships and we have suggested that the work of Gibb can provide practical guidance in implementing Rogers' philosophy. Further, we feel that individual differences in decision-making are an important part of any consulting relationship. We have explored the work of Jung as the theoretical basis for several descriptions of decision-making types and have focussed upon the work of Johnson as a practical and theoretically sound approach to dealing with decision-making styles.

Finally, we have observed a need to train developers in the consulting process. Savage has adapted Kagan's IPR system to train empathy skills in graduate students, and Stonewater and Coscarelli have developed a model for training people in identifying Johnson's decision-making types. We believe that these skills are typically missing from the ID curriculum and should be an integral part of any graduate training program. We recognize that many of the skills we have discussed have been tacitly employed by many skilled designers. It has, in part, been our task to make explicit the components of the consulting process.

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Chapter 22

The Initial Client Conference: Implications for Continuing Relationship

Robert D. Price

What happens when a client and a consultant interact? What factors can aid this process of interaction to occur more smoothly. This chapter describes some of these factors and shows how the instructional developer can use them to improve his relationship with his clients.

INTRODUCTION

When an instructional developer interacts with a new client for the first time, the skills that are utilized by the developer in responding to client concerns and the techniques s/he uses to establish a healthy working relationship are both extensive and complex. These instructional developer behaviors determine the nature of the continued working relationship. Such initial behaviors may determine the level of productivity of the relationships as well as the degree and kind of energy necessary to manage a relationship that is personally and professionally satisfying for both the client and the instructional developer.

The skills and techniques that should have competencies, to maximize the outcome of an initial interaction, include the areas of learning systems design, media/materials devlelopment, and evaluation. In addition, "people-oriented" competencies are necessary, including the ability to determine real as opposed to stated client needs (if there is a difference); dyad communication; psychological contract and negotiation; clarification of assumptions and expectations of the working relationship; client reinforcement; organizational behavior; work relationship monitoring; role negotiation; and establishing of working objectives. This list is not all-inclusive; however, these issues will be the concerns of this chapter.

DEVELOPER NEED—CLIENT NEED

The instructional developer and the client usually have multiple reasons for meeting. The developer, in fulfilling the mission of the instructional development service organization, is responding to an institutional commitment to quality education by working with faculty to upgrade the quality of teaching. The developer may also be implementing a set of specifically stated program objectives for the instructional development unit which are aimed at a particular faculty member (who is an opinion leader), a department, or a college. The instructional developer may also be spending time with this particular client because of special research or teaching money that the client may have which may benefit the instructional development program. Other realistic, but not always stated, secondary reasons for interest in a particular client have to do with the potential for a publication or a conference presentation by the instructional developer.

The client may be there because of a genuine concern for instructional quality brought about by self-evaluation or negative student feedback. The client may have been told by a department chairperson or a dean to get assistance in her/his teaching. In such a case, few faculty members can say to the developer that their teaching needs improvement. In many cases the real reason for the visit to the instructional developer is clouded in other verbalized reasons, such as "I want to improve my classroom evaluation," or "I would like to develop a video tape on ___________," or "Can you help me to develop a set of overhead transparencies on _____________," or any one of many reasons which could be given. The developer may choose to grab at the first "problem" identified by the client in an attempt to "solve the problem."

In analyzing instructional developer verbal behavior in initial client contacts, Price (1978) found that developers average 75% of their time discussing solutions to a problem or problems. Davies (1974) also noted the tendency of instructional developers to jump too quickly into problem solving for the client; he indicated that instructional developers have a strong desire to get on with the job rather than to establish a relationship. The developer needs to be aware that in trying to solve the problem too fast, he may not be responding to the client's real assistance needs.

Other reasons that clients may have for asking for some of the developer's time can include such general concerns as helping with departmental curriculum or helping with a special interest project. It is impossible to identify all of the possible reasons a client may seek out the instructional developer; but there are key questions the developer should use in assessing whether the clients stated purpose is consistent with how the developer should be expending the instructional development unit's time. Some of these key questions include: (1) Is the client's stated problem consistent with the instructional development unit's program objectives and mission? (2) Do the client's concerns benefit a large enough number of faculty members or students? (3) Does the client's problem fit with the priorities of his department or college? (4) Does the client have a philosophical and professional orientation which will result in very little productivity in the relationship and produce more disagreement than positive outcomes? (5) Do the client's concerns fit with the developer's personal and professional objectives?

It is important that, during the early stages of establishing the developer/client relationship, the developer not be naive about the purposes and needs of the client, nor about his own needs or the needs of the instructional development unit. It is also important that during this early stage of communication, called "breaking the ice" by Silber (1973), that a warm, open and cordial atmosphere be established between the client and the developer as mutual needs, purposes and values are explored.

LISTENING--NOT TELLING

Depending upon the individual client and the complexity of the client's needs, the whole of the first face-to-face meeting may be concerned with the gathering of information about the client and his perceived needs. The primary role of the instructional developer during this initial communication should be one of listener. Only by being a good listener can the developer establish a database upon which to formulate the best possible response to make to the client. This suggestion is inconsistent with what Price (1976) found instructional developers actually doing during their first initial meeting with their clients. During their first contact with their clients, if problem-statements are presented it is wise for them to spend their time gathering data related to the problem rather than in proposing solutions. If the instructional developer adopts this strategy, it becomes crucial for her/him to be an attentive and analytical listener.

NON-VERBAL COMMUNICATION

The instructional developer must also be a student of non-verbal communication during the initial client/developer interaction. Such knowledge of voice cues, body language and facial expression may provide important information as to possible incongruency between what the client is saying and what the client feels and believes. Such perception on the part of the instructional developer may help her/him in deciding what other areas of the discussion need further clarification. The instructional developer's perceptions will allow for further clarification in certain areas of discussion, or may allow adequate assessment of the client's commitment to the objectives of the working relationship.

ASSUMPTIONS AND EXPECTATIONS

Another outcome of the first meeting with the client should be the examination of assumptions and expectations. When the client comes to the developer, s/he has certain assumptions about what the developer does and how it is done. For example, a client may believe that s/he brings a particular problem to the developer and the developer solves the problem, does all the work and returns a completed product to the client. In the above case, the assumption is that the developer is going to do all the work and the expectation is that the client will have a completed product by a certain date. If this is not the way the developer works, then the developer needs to find out about these false client assumptions early in the relationship. Some instructional developers work only as consultants who send the client away to do the work, to return at a later date for the developer to review the work which has been completed to that point and to make further suggestions. Some developers will do part of the work, such as writing the objectives, but will leave most of the development activities to the client. Some developers consider the client a learner in the relationship and assume that they are teaching someone who will later function independently. It is extremely important that these and other assumptions be clarified while the relationship is being established. It is also important that the role expectations held by each party and the outcomes of this relationship be established. This can be done by entering into an informal or formal contractual arrangement with the client.

THE CONTRACT

Also included in the domain of the first meeting is the development of a psychological and/or a written contract. The purpose of such a contractual arrangement is to establish, in as much detail as possible, tasks, roles, responsibilities, time-lines, time commitments and accountability. After a clear definition and understanding of the need or problem, and a discussion of the alternatives, a list of tasks needs to be written for the implementation of one or more of these alternatives. In a careful and non-threatening manner, so as not to bombard the insecure client with overwhelming work, assignments should be negotiated with the client. This is an early point of determining the client's commitment to the relationship. It is important that the developer does not try to accomplish too much too fast, but works with the first few tasks and negotiates responsibilities for them, listing specific strategies for each task, with a time-frame for completion. The rest of the tasks can be discussed in a general way to give the client (and the developer) some direction in terms of accomplishments over a broad time frame.

The instructional developer must "read" both verbal phrasing and tonality as well as non-verbal cues to interpret the client's time commitment to the tasks at hand. The developer should not disregard any direct concerns or statements regarding time or commitment. Any such cues, either verbal or non-verbal, should be considered as possible red flags to problems ahead for the relationship.

It is important that during the contracting phase the instructional developer maintain a posture of equality with the client. This can be done by knowing the desired outcome of this particular interaction and the process that is being followed to attain this outcome. Equality can also be achieved by maintaining the role of the professional education specialist with a body of knowledge deserving of an amount of respect which is equal to that deserved by the client's discipline.

The contractual arrangement with the client, whether it be psychological or written (written is preferred), should result in a clear definition of roles and responsibilities, and a time frame for proceeding on specific tasks if enough data is available to move toward such a direction in the first meeting.

CLIENT'S REINFORCEMENT

During the entire first meeting with the client, it is extremely important for the client to be positively reinforced for being a high quality professional, desirous of change and innovation and concerned about the quality of teaching and learning. It is also important that the client be reinforced for all suggestions and ideas, however insignificant they may seem to the developer. It is important for the developer to remember that in most cases the client has taken a risk in asking for assistance. It is difficult for faculty members to take risks where their professional image is concerned, so they need to feel good about their decision. The instructional developer can develop this good feeling through the positive reinforcement of client behavior throughout the initial meeting. Positively reinforcing the client will tend to build a strong, trusting relationship if the reinforcement is genuine. The reinforcement can be genuine if the developer is sensitive to those instances in any discussion where the client can be praised. It is important to note that if such reinforcement comes at a time that is inappropriate or is perceived as insincere, distrust and lack of confidence in the instructional developer will result.

DANGER SIGNALS

During the initial interaction with a new client the instructional developer should keep a watchful eye for the danger signals that may forecast problems ahead. A few of these have been previously mentioned, but there are several others which should serve as red flags to the instructional developer. One of the most common signals is when the client continuously makes negative comments about situations or conversations that seem to be proceeding smoothly. Another, and related, signal is when the client is generally negative about everything discussed in the initial interaction. The rigid or closed client, or the client who is obsessively concerned about an insignificant point or issue, or who is unable to see different points of view will continuously be a problem to the instructional developer, and will result in little or no productivity in the relationship. If the client has a history of being unresponsive to change, then it may not be worth the developer's time and effort to spend much time with her/him. The "ain't it awful" client that only wants to talk about how bad things are, will probably not make efficient use of the developer's time. While working with a client, if there is any hint of being used as a pawn in a political situation, that is a cue to get out as fast as possible. Much thought also must be given to the client who represents a system that has a history of no support, either financial or moral. Diamond (1975) describes the cooperation of the leader(s) of a system as essential before any commitment should be made by an instructional developer.

If the instructional developer is to use his time efficiently, then close attention must be paid to these danger signals and others that were mentioned earlier in this chapter. Not being attentive to such cues in the initial stages of a client relationship can result in the use of much time and energy with very little return. In the instructional developer's working world this return and productivity are used as measures of success of the individual developer as well as the instructional development program. Also, those clients with little productivity are often the same ones who become critical of the instructional development program when support is being sought for growth or survival. Those clients who truly need the services of the instructional developer and who respond to the developer's skills will become clients who learn, and who reward the developer as much as they are rewarded. This latter group makes the instructional developer's role a rewarding one.

MONITORING THE RELATIONSHIP

If the instructional developer has done a good job in developing the client contract, then the relationship is well on its way towards the establishment of a basis for a good project monitoring process. From the contract, the developer and the client can establish project objectives, which serve as a method for keeping the project on track. The tasks which were mentioned earlier in the contract stage are specific activities which must be completed in order to achieve the project objectives.

One project objective may involve several tasks. Rather than thinking about objectives while establishing a contract, it is usually best to begin at a more specific level, such as with those specific tasks to which the client can better relate. Clients generally like to group tasks, and this grouping process can result in objective statements which summarize and tie together the groups of tasks. The project objectives, the tasks, their timelines and the role definitions become the basis for the monitoring of the project. At any given meeting, discussion should occur concerning the status of each task. This kind of activity is what keeps the project on track and keeps all concerned parties accountable for its successful conclusion. This process is even more important if other faculty members, administrators or production personnel are brought into the project. Another aspect of the monitoring function is the communication of the purposes and current status of the project to the key individuals whom the project will affect. Following the initial meeting with the client, a summary of the meeting should be written and sent to the client and to the client's immediate supervisor and, if instructional policy is not inconsistent with such a strategy, to the dean of her or his college. If the instructional developer works for a Director of Vice-President of Academic Affairs, this person should also receive such communication. In addition to the memo summarizing the meeting with the client, the instructional developer should also summarize the contractual arrangement in a form similar to that of Figure 22-1.

PERSONAL SECURITY

Arbuckle (1970) indicates that the ability of a counselor to establish rapport with a client and to overcome crucial problems in the relationship depends upon the counselor's life experiences and personal security. This also may be true of instructional developers. Those instructional developers who seem to be the most productive with their clients are those who seem to be the most personally secure and those who have had a wide range of life experiences. Those developers who seem to be most secure with their clients are those who also seem not to have to prove themselves to their clients, and those who apparently do not feel a need to "solve the problem quickly" also seem to be personally secure. They seem to "stroke" the client easily, but not inappropriately, and also seem to take "strokes" from the client in a healthy and non-threatening manner. They also seem to get to know their clients as people, and as a result, may be more effective at arriving at the client's "real" problem. These instructional developers also seem particularly adept at identifying the client who is not really committed or who is using them to achieve a secondary gain.

SUMMARY

This paper has described several crucial aspects of the initial phase of the instructional developer/client relationship which have direct impact upon the longitudinal aspects of this relationship. Those areas which have been identified in this chapter include: (1) determining why the client has sought assistance; (2) the rationale for testing assumptions and clarifying expectations; (3) contracting with the client; (4) establishing monitoring procedures for the working relationship; and (5) danger signals for potential client problems. These competencies, along with the personal security held by the instructional developer, are important factors in determining whether the developer/client relationship is a rewarding one for both the client and the developer.

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Figure 22-1. Summary of contract.

PROJECT OBJECTIVE 1. -

TASK	COMPLETION TIME	RESPONSIBILITY
1		
2		
3		
4		
5		

PROJECT OBJECTIVE 2. -

TASK	COMPLETION TIME	RESPONSIBILITY
1		
2		
3		
4		
5		

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Chapter 23

Consultation in Instructional Development: A First Look

David P. Rutt

Is the instructional developer/client relationship a consulting relationship? If so, do instructional developers employ a specific consulting model in this relationship? This chapter reports the results of an instructional development consultation style survey which was mailed to 83 IDers across the country. In addition to discussion of the survey results the author provides a look at future directions in analysis of the IDer/client relationship.[1]

The instructional developer (IDer) employs various strategies of instructional development while working in conjunction with a subject matter expert (SME) on an instructional problem. In most cases within higher education, the SME, and not the IDer, will implement the solution to the problem. This type of relationship can best be categorized as a "consulting relationship" following Steele (1975) who defined consulting as: any form of providing help on the content, process, or structure of a task or series of tasks where the consultant is not actually responsible for doing the task itself but is helping those who are.

Steele also pointed out that the recipient of such help--the client--has the option to freely reject it at any time. In addition, Steele also made it clear that consulting is not necessarily a "strict occupational role" but rather a function that can be applied to many areas. It is a set of skills within a number of different frameworks or models which reflect different professional points of view.

The IDer may thus be considered a consultant since help is provided to a subject matter expert who has the option to accept or reject such help. In addition, following Steele, the IDer is not concerned with doing the task (such as teaching or running an autotutorial lab) but rather with helping the SME implement the tasks and solve an instructional problem more effectively.

In establishing a consulting relationship with the SME, two systems will function concomitantly: the instructional development system and the human system (Arnn and Strickland, 1975). Normally, the primary emphasis during an instructional development effort is the instructional development system. The use of this system does not necessarily guarantee an appropriate and successful solution to an instructional problem. It is also necessary that the human system be considered in the instructional design effort. In thinking about the instructional development process, considerations about the human system of interaction between the IDer and the SME have usually been omitted. It is through the establishment of a consulting relationship that the human system can be effectively managed toward the attainment of a desired goal.

An extensive amount of research completed in recent years has directly influenced the instructional development process. Such research has involved inquiry into many topics, including aptitude treatment interaction, learning hierarchies, concept formation, and message design (see Baker, 1975). In contrast, it appears that little information is available beyond heuristic guidelines to aid the IDer in establishing a relationship with the SME (see Haney, Lange, and Barson, 1968, and Kemp, 1971). A review of many of the texts used by IDers reveals little information useful in establishing a consulting relationship (Briggs, 1977; Davis, Alexander and Yelon, 1974; Gagne and Briggs, 1974; Gerlach and Ely, 1971).

The purpose of this chapter is to explore various aspects of consultation as it pertains to IDers, to propose a framework useful in exploring this important area, and to discuss the results and implications of initial research using this framework.

CONSULTING AND INSTRUCTIONAL DEVELOPMENT

With the increased formalization of instructional development, the role of the IDer has emerged. If we assume that the IDer will utilize the instructional development process to solve instructional problems, the question then arises as to how this process might be utilized. Will the process be utilized by the IDer alone or in concert with either another IDer or a subject matter expert (SME)? Certainly, the instructional development process is not the exclusive property of the IDer in terms of utilization. Figure 23-1 presents a number of possible configurations that might exist when instructional development is utilized. Though cells 2, 3, 4, and 7 are possible and may exist, for the purposes of this study the relationships that stem from cells 5, 6, 8, and 9 will provide the focus for further discussion.

	No Developer	Single Developer	Team of Developers
No SME	1	2	3
One SME	4	5	6
Team of SMEs	7	8	9

Subject matter expert

Figure 23-1. Instructional development utilization matrix.

The notion of the IDer working with a subject matter expert was first mentioned by Faris (1968) in a "futuristic" job description. From his perspective, the IDer is a person who works with faculty members in the development of instruction, including the analysis, design, and evaluation of instructional practice. He also concluded that the IDer must be capable of guiding the activities of an interdisciplinary team in the performance of the above tasks. This is a clear indication that some notion of consulting, or at least helping, is indigenous to the role of the instructional developer.

Engel (1969) found support for this idea in a survey he conducted to assess the activities of IDers in higher education. It appears that the IDer does carry out the analysis and design activities suggested by Faris. Furthermore, such activities are carried out in conjunction with a team of curriculum experts, psychometrists, educational psychologists, media production specialists, and faculty members who are the subject matter experts. It seems the IDer must not only have a thorough understanding of instructional development but must also have management and interpersonal skills necessary to establish a working relationship with people of such diverse backgrounds.

Hoban (1973) provided further support for the findings of Engle. The majority of an IDer's time is spent with activities that include administering a large instructional development project, teaching instructional development, and acting as a consultant to a development project. Again, it appears that consulting is a recognized and accepted part of the instructional developer's professional role. However, the exact nature of this activity was not determined in this study.

Price (1976) carried out what appears to be the only research dealing with the process of consulting in instructional development. The purpose of this study was to examine the verbal behavior of IDers as they met with new clients for the first time. The verbal utterances of the six IDers in the study were transcribed and the content analyzed. Three major categories of verbal utterances, each containing a number of subcategories, were identified as follows: a) four consulting phases--introduction, problem identification, solution discussion and closure; b) five categories of content utterances which included substantive and instructional design utterances; and c) twelve categories of process utterances, which included comments concerning the interaction between the developer and the client.

The results demonstrated some support for the consulting models of Davies (1975), Silber (1973) and Havelock (1973). The majority of the comments made during the interaction were by the IDer and occurred primarily during the phases of problem identification and solution discussion. In the content category, the IDer spoke mostly about methods mainly concerned with "explaining concept and principles" to the client and "opinioning"; i.e., the IDer expressing a personal point of view.

It is important to note that Price utilized what could best be labeled as a "Collaborative Model" in his study. Employing this model implies certain assumptions about a consulting relationship. It appears from the paucity of research in the area of consulting and instructional development that it may be somewhat early to presume that this is the model. A close examination of Price's data revealed that when IDers encountered a variety of instructional problems (to be discussed below), they responded verbally in remarkably diverse ways. Though Price found some support for a Collaborative Model, his results also lead one to ask if other models of consultation are utilized by the instructional developer, and if the instructional problem that confronts the IDer has any influence over his use of a certain model. We will first examine a number of other models that may prove useful for describing the instructional designer's consulting behavior. Considering the potential effect instructional problems may have on consulting behavior, an examination of the IDer's task environment will then be undertaken.

MODELS OF CONSULTATION

Consulting is not a strict occupational role, as pointed out above, but rather various skills set within a framework or model that manifests the perspective of a particular profession (for example, see Argyris, 1970; Havelock, 1973; Brokes, 1975; Kurpius and Brubaker, 1976; Klein, 1977; Caplan, 1970; Schein, 1969). These "points of view" are nothing more than assumptions made by a profession about the role of the consultant and client within the consulting relationship.

Davies (1975) has suggested that a number of different assumptions may form the foundation of a relationship, but normally a few will dominate and enable us to classify such relationships. He has labeled three such classes of assumptions: product-oriented, prescription-oriented and product/process-oriented.

Tilles (1961) used three similar classifications for the consulting relationship and labeled them Purchase-Sale, Doctor-Patient, and Constructive, respectively. Schein (1969) also suggested three possible consulting relationships: the Purchase Model, the Doctor-Patient Model and the Process Model. Drawing from these sources, the three sets of assumptions used in the present study were labeled the Product Model, Prescription Model and Collaborative/Process Model. In addition, a fourth set of assumptions has been identified that are more relationship-oriented and less task-oriented than the other three. Following the ideas of Blake and Mouton (1964, 1978), this last set of assumptions will be labeled Affiliative. The labels used here were adopted because they communicate more precisely the role of the IDer. These four models and their underlying assumptions will now be discussed.

Product Model Assumptions. Under this set of assumptions, the consultant is viewed as a seller who is approached by a buyer with a problem. It is assumed that the client has correctly identified the problem and the appropriate form of the solution and can also determine the conditions for delivery. The consultant is expected to "deliver the goods" as requested, which will usually take the form of information, a service, or a product; e.g., provide books on behavioral objectives, design a test, or produce a filmstrip.

This relationship may be appropriate when there is little question of the specified problem because of the client's expertise or when it is simply expedient on the part of the IDer to "go along with" the client. If one goal of the relationship is to influence the long-term behavior of the client, a number of reservations about this model must be raised. With this model, it can safely be assumed that the normal routine of the client will not be disrupted while the product or service is being developed. Some long-term behavioral changes may take place as a result of "information flow" between the consultant and client, but whether this information leads to "constructive" purposeful and effective activity" on the part of the client is questionable (Tilles, 1961). The effectiveness of the product developed must also be questioned because it may be something beyond the sophistication of the client.

Prescription Model Assumption. Within this set of assumptions, the roles of consultant and client are reversed in terms of problem identification and solution. The client initiates the relationship by stating a concern about an existing situation; e.g., "My students don't seem to enjoy my lectures any more," or "I think my class needs more audio-aids." The client does not have the skills to diagnose the problem, and thus it is up to the consultant to carry out the analysis and diagnosis of the "concern" to identify the underlying problem (Schein, 1978). The assumptions underlying this model are that the consultant has the authority and skills to carry out a diagnosis, and the solution will be accepted by the client. This model obviously stems from the field of medicine and also appears to be a popular mode of action in the area of management consulting (see Klein, 1977).

Such a relationship has a number of advantages. The most obvious is that the consultant has the "upper hand" in the relationship, with the authority of a specialist involved in an effort to help the "sick" client. The consultant may emerge from such a relationship with new or refined skills of analysis. The client may develop both an increased awareness of the existing situation and knowledge that may prove useful for examining similar situations in the future.

A relationship based upon these assumptions also has a number of disadvantages. As the IDer enters the setting to help the client with the perceived concern, the first things to be considered are discovering the basis for this concern and determining if it is the "true concern." The situation is further complicated if the size of the client group is large, since it may also be necessary to determine the true client. The client may also be unable, or at best reluctant, to accept or implement the suggested solution. As a result, any long-term effects upon the client may be minimal. Tilles (1961) has noted that, assuming a client needs help, such help can only come from the client. It should be realized that improving one's situation requires a great deal of effort. It is frequently difficult for the client to master the skills or new behavior required for such a change to take place. This is one area in which the consultant and the client may be able to work more fruitfully together. However, this kind of joint effort is not provided for by the medical analogy.

Collaborative/Process Model Assumptions. The logical manner in which to start talking about consultation is to raise the issue of desired results from the consulting relationship (Tilles, 1961). In the case of the Purchase Model, the desired results stem from the need for some type of information, product, or service by the client. The Prescription Model requires that the results take the form of a prescription to solve an existing concern of the client. With the specification of the results, the client and the consultant are locked into certain role behaviors with concomitant expectations for each other's behavior. The same can be said for the Product Model.

The Collaborative/Process Model makes no **a priori** assumptions concerning the desired results of the relationship which may lead to a relatively fixed set of behaviors. Rather, it involves a system of decisions, which are reached by agreement, concerning what is expected to be achieved, the nature of the help required, and the changing roles that will be exercised (Davies, 1975).

Within this model, it can be assumed that the client is aware of an existing problem but may need help in further clarification of that problem. The IDer and the SME bring to the relationship certain expectations arising from their respective professional roles. It can also be assumed that the variance in their expectations concerning the relationship can be negotiated to the mutual satisfaction of both parties. This may result in a variety of roles emerging to fit the requirements of the various projects.

The goal of this model is to realize the intended instructional outcomes either in terms of increased student achievement or the more effective use of available resources (Davies, 1975). A secondary goal, though one of no less importance, is that the client will be able to apply skills learned during the instructional development process to future instructional problems. For the IDer, this may not mean a reduction in the need for instructional development expertise but rather the promise of a more sophisticated relationship with the client in the future.

This relationship also has a number of drawbacks. The scope of the project or the available time may not lend itself to the utilization of this model. Also, the client may not be receptive to the openness that is demanded of such a relationship, or conversely, the IDer may not feel comfortable utilizing this model.

Affiliative Model Assumptions. Under this set of assumptions, it is necessary that the consultant emphasize good interpersonal relations with the client to be effective. This will be done even at the expense of task accomplishment. The consultant is concerned with ensuring that the client is satisfied and that a well-ordered environment is maintained. The consultant seeks approval from the client by using ingratiating behavior to increase the chances of approval and reduce the risk of confrontation and rejection (Blake and Mouton, 1978).

It is entirely possible that the consultant will work very hard. Unfortunately, the motivation for this hard work is to gain approval from the client rather than to solve an instructional problem. The result will be a high work level with low productivity.

When a consultant operates under these assumptions, a number of conditions will exist in the relationship: little or no conflict occurs, total acceptance of client suggestions and ideas by the consultant and anticipation of the desires and wishes of the client. These conditions would appear to primarily benefit the client.

However, if productivity is not an issue in the particular environment in which this model is practiced, such conditions may be acceptable.

PHASES IN CONSULTATION MODELS

A consulting relationship passes through different stages or phases. The exact identification of these phases is still subject to dispute. An analysis of the consulting models of Brokes (1975), Kurpius and Brubaker, (1976), Davies (1975), Schein (1969, 1978), Argyris (1971), Havelock (1973), and Caplan (1970) reveal at least three phases that are held in common. These phases are entry, analysis-diagnosis, and problem solution.

In the entry phase the major concerns are with the client and consultant getting to know one another, establishing the nature of the problem, and identifying methods and procedures for solving the problem. In the analysis-diagnosis phase, data may be collected to further clarify the nature of the problem. This may lead to revisions in the definition of the problem and procedures for solving the problem and changes in estimates for needed resources. During the problem solution phase the plan for reaching certain goals or solving an instructional problem are finalized and implemented. During this phase the relationship may be re-examined and terminated.

Kurpius and Brubaker (1976) have noted that most consulting models share at least those phases identified above. They have also suggested that differences between models are to be found in the emphasis placed upon a particular phase within a certain model. This difference in "emphasis" is manifested in the consultant's behavior during the

Consultation Models

Phases	Product	Prescription	Collaborative Process	Affiliative
Entry				
Analysis Diagnosis				
Solution				

Consultation Models by Phases — Responses

Figure 23-2. Consultation models by phases matrix.

phase. These behaviors can probably be identified and classified based upon the assumptions associated with each model discussed above. The matrix in Figure 23-2 displays the interrelationship between phases and consultation models.

THE TASK ENVIRONMENT OF INSTRUCTIONAL DEVELOPMENT

The IDer employs a variety of procedures in the process of designing a learning environment. These processes include task analysis, learner analysis, determination of teaching strategies, and evaluation. These procedures and others are brought to bear on the instructional problem with which the developer is faced. In this study it is these problems that constitute the tasks with which the developer must deal. The task environment of instructional development thus consists of all tasks with which the developer is confronted in the design of a learning environment. As is true of consultation in instructional development, little work has been done to specifically identify the elements that compose the IDer's task environment. However, enough work has been completed to draw a tentative picture.

Engel (1969) noted that most of the work of the programs he surveyed occurred at the unit or course level. Hoban (1973) was also concerned with the level at which IDers concentrate their effort. He found, like Engle, that the majority of an IDer's time is spent on tasks at the course level, with a lesser amount of time on both the single lesson (unit) and "sequence of courses" (curriculum) level.

Alexander and Yelon (1972) identified the service, research, and teaching functions of a number of instructional development organizations in higher education. Their work also provides a more detailed picture of the task environment:

1. conduct workshops
2. assist departments in the analysis, planning, and design of curriculum
3. assist faculty in the development of instructional materials
4. help write internal publications; i.e., handbooks, project reports, etc.
5. consult with individual faculty members
6. provide test scoring and analysis services
7. provide instructional T.V. services
8. administer and score standardized tests
9. provide media equipment (store, repair and distribute)
10. maintain reference library on instructional development topics for higher education
11. maintain laboratories for faculty research and development in instruction
12. provide administration with technical advisory services regarding instructional development

A review of the individual organizational descriptions included with the final report failed to specify the nature of the consulting activities engaged in with faculty members.

In the Price (1976) study, the problems brought to the instructional developers were not considered in the analysis of the data. An examination of these problems provides further insight into the task environment of instructional development:

1. design curriculum for 4-H
2. design four half-hour workshops on menopause
3. improve graduate education course
4. improve a course by adding media
5. evaluate and field-test instructional package
6. help improve performance of guest lecturers
7. develop course objectives and improve teaching methods
8. improve course effectiveness

The main areas of focus in the Price study appear to be at the curriculum and course level. The types of activities with which the developer is concerned involve writing objectives, test design, evaluation, media design and production, and content reorganization.

The results of Engel (1969), Hoban (1973), Alexander and Yelon (1972), and Price (1976) converge to provide us with a preliminary view of the instructional developer's task environment. It appears that most design tasks are at the course level though the IDer will encounter some on the unit or curriculum level. These design tasks will call for either some type of instructional strategy modification or the introduction of media as a possible solution to the instructional problem. The instructional design modifications involve such activities as writing objectives, designing tests, reorganizing content, and evaluating. The introduction of media usually involves television, slides, or overhead transparencies.

Davis, Abedor, and Witt (1976), drawing upon their experiences with the Educational Development Program at Michigan State University, constructed a matrix to organize the instructional tasks with which they were confronted. They have identified "as a first approach" that most instructional development projects range along two dimensions: a) size or scope of the system under development; e.g., several courses or a curriculum, one whole course, or part of a course (unit); and b) the type of innovation or improvement requested by the client; e.g., revision of instructional strategies or an infusion of some type of instructional media or technology that does not constitute revision of the entire course.
The matrix in Figure 23-3 illustrates these two dimensions of system scope and innovation type. The findings of Engel (1969), Alexander and Yelon (1972), Hoban (1973), and Price (1976) concerning the task environment of instructional development can be organized into the cells of this matrix. It, therefore, seems reasonable to conclude that, at least for the present time, this matrix provides a useful mechanism for organizing the task environment of the instructional developer.

THE TASK ENVIRONMENT AND CONSULTATION

Consulting consists of a complex array of skills that must be appropriately matched to a particular problem in a given setting for certain desired outcomes to be achieved. Such matching involves a complex set of decisions on the part of the consultant. the basis for the consultant's decision-making process has been proposed by Gallessich (1975). She contends that the decision as to which services will best serve client needs is crucial. Yet, explicit and truly discriminating choices are probably rare. The decision-making process used by the consultant is influenced by a number of variables. One is the consultant's "set" or the perceptual framework and methods of organizing data. This set is shaped by early experiences in a training mold. Gallessich asserts that once "imprinted," the consultant's set is unwittingly constricted as the client organization is surveyed and possible interventions are considered. Another variable is the lack of knowledge; most consultants have limited acquaintance with intervention strategies. And most have a rather narrow range of skills and too often try to fit the task to their particular skills. Consultant values, usually implicit, further limit options.

System Level

Innovation Type	Curriculum	Course	Unit
Instructional Strategy			
Media Augmentation			

Task Environment of Instructional Development

Figure 23-3. System level by innovation type matrix.

It is reasonable to assume that each of the factors identified by Gallessich influences how a consultant operates within the task environment. We may also assume that each consultant has an idiosyncratic manner for responding to the task environment based upon some type of internalized consulting model. This model may manifest itself in a series of behaviors that could then be used to identify an individual's consulting model-in-use. The next step is to determine if the behaviors are congruent with any of the theoretical models of consulting. Much of the consulting research reviewed by the author has attempted to identify a general consulting model that is usually based upon collaborative assumptions. Considering the complex task environment of the instructional developer, it would seem inappropriate to suggest the use of an unvarying model of consulting when one considers the comments of Gallessich.

Clark and Ford (1970) have pointed out that little is known concerning the analytical framework used by consultants to examine a particular situation. Their research tracked the use of analytical models employed during the consulting relationship. It was discovered that consultants engage in "model switching"; that is, the consultant switches from one analytical framework to another in an attempt to understand the organization-to-environment relationship. In a similar fashion, the IDer may also engage in model switching as the client relationship progresses or new tasks are encountered.

Additional support for the idea of model switching comes from the work of Arbes (1972). He explored the manner in which student personnel administrators responded to situations within their job context, while also identifying the way other members of the university community responded to the same situations. Using the model of managerial leadership and change of Blake and Mouton (1964) as a framework, the prevalent model with student personnel administrators was identified as the "team leader" style which has a strong collaborative and participative emphasis. The next most popular model identified was the "country club leader" style which emphasizes people relationships with a minimal emphasis on goal and task attainment. Arbes suggested that student personnel administrators may "fall back" to this style when the first does not work or they are under some type of pressure. His research did not examine the changes that might occur during the consulting relationship.

Clark (1975) suggested that although the collaborative approach has been advocated, there is evidence of success with other strategies. However, the "core problem," as he points out, appears to hinge upon the identification of the conditions under which different strategies (or models) are appropriate. The work of Dunn and Swierczek (1977) in the area of grounded theory in planned change has provided empirical support for the collaborative model, but they also noted that the exclusive effectiveness of such a model is still in doubt.

In conclusion, it appears that a number of consulting models in addition to the Collaborative/Process Model could be employed by the IDer, including the Product and Prescription Models. The work of Arbes (1972) suggests that a fourth model might be employed, one that is more relationship-oriented and less task-oriented than the other three. Such a model has been labeled the Affiliative Model and is discussed above. Whether any of these models are used by IDers is not known. It also seems that variations in dimensions of the Ider's task environment may result in the differential selection of a consulting model (model switching). Thus, a certain model might be employed under one set of conditions in the task environment, and a second under another set of conditions.

It was hypothesized that IDers in this study would prefer a Collaborative/Process Model over the other three. Two interactions were also hypothesized which predicted a relationship between consulting models and either system scope or innovation type: IDers would prefer a Collaborative/Process Model when the problem was at the curriculum level and a Product Model when the problem was at the unit level. With innovation types, the IDer would prefer the Collaborative/Process Model with an instructional strategy innovation and the Product Model with a media augmentation.

METHOD

Subjects

The subjects in this study were IDers working with clients on a regular basis within four-year institutions of higher education. Davis (1978) recently reported the results of a survey he carried out which profiled 16 instructional development programs operating on college and university campuses across the country. Using this list as a starting point, the head of each program was contacted and asked to provide the names of IDers working with clients. Through these contacts, other names or institutions were acquired and subsequently contacted. This effort resulted in a sample of 83 IDers actively working as instructional developers throughout higer education.

Instrument

The Instructional Development Consultation Style Survey (IDCSS) was designed for use in the study. Two dimensions that comprise the IDer's task environment were identified above as system scope and innovation type. System scope consists of three levels: curriculum, course, and unit. Innovation type consists of two levels: instructional strategy changes and media augmentation. These two dimensions, when crossed, provided a six-cell matrix that provided the basis for six scenarios. For example, one of the scenarios portrayed an instructional strategy change at the curriculum level.

The four consultation models and three phases identified above provided the basis for describing the range of possible behaviors an IDer might employ under the conditions described in the scenario. For each scenario, a statement was written describing a behavior for each consultation model within a particular phase. This resulted in a total of 12 statements per scenario.

Statistical Design

The design that was used in this study consisted of a 2 x 3 x 3 x 4 factorial analysis of variance employing repeated measures on all four main effects. The main effects with their respective levels are: innovation type (1), system level (2), consulting phases (3), and consulting models (4). The dependent variable was the agreement rating that measured on a ten point scale the degree to which a subject agreed that a particular statement of consulting behavior was close to their own actual behavior under the conditions of the scenario. A rating of 1 was the "least similar" and a rating of 10 "most similar."

The use of a repeated measures design provides an exploratory study such as this one with a number of advantages. Rather than subjects being randomly assigned to treatments, each subject is exposed to all treatments. This enables each subject to serve as her or his own control. This eliminates the effect of individual differences existing prior to being exposed to the scenarios from the treatment effects and experimental error. Also, since each subject is exposed to all treatments, there are more degrees of freedom for the denominator of F for a given number of subjects. This should increase the power of the tests of significance. The critical region for tests of significance was established with alpha equal to .05.

Data Collection

The IDCSS was assembled by randomly ordering each response statement within each phase. Using a table of random numbers, each subject was assigned a six-digit number that was used to both randomly order the six scenarios and serve as an identification number for each subject. The IDCSS was mailed to 83 IDers working in institutions of higher education throughout the country.

RESULTS

Table 23-1 displays the results of the analysis of variance and the omega-square values for each independent variable and interaction. All independent variables, with the exception of innovation type, were significant. All independent variables, with the exception of innovation type, and all interactions were significant at the $p<.05$ level. An examination of Table 23-1 also reveals that only the main-effect consultation models had an omega-square value that accounted for more than 1% of the variance. The third order interaction of innovation types by phases by system levels by models accounted for 14.96% of the variance. The total amount of variance accounted for by all main effects and interactions was slightly more than 30%. This is rather remarkable considering the preliminary nature of this research. Also, in view of the relatively large amount of variance accounted for in the third order interaction, consulting is apparently a very complex activity. This activity encompasses, and is influenced by, a variety of interpersonal, intrapersonal and environmental factors, only some of which were operationalized in this study.

Table 23-1. Analysis of variance for mean agreement rating.

Source	Error Term	SS	df	MS	F	Ω^2
Subjects (R)		1597.88	47	33.997		
Innovation Type (I)		3.89	1	3.893	NS	.000
	IR	187.63	47	3.992		
Phases		71.48	2	35.747	9.097*	.0023
	PR	369.36	94	3.929		
System Level (S)		183.77	2	91.886	20.66*	.0063
	SR	418.09	94	4.447		
Consultation Models (M)		421.45	3	140.483	14.91*	.0140
	MR	1328.46	141	9.422		
I x P		61.76	2	30.882	12.55*	.002
	IPR	231.21	94	2.459		
I x S		123.79	2	61.996	13.49*	.004
	ISR	431.18	94	4.587		
P x S		68.16	4	17.040	6.87*	.002
	PSR	465.64	188	2.477		
I x M		276.96	3	92.320	16.38*	.0093
	IMR	794.40	141	5.63		
P x M		614.90	6	102.483	14.25*	.021
	PMR	2027.68	282	7.190		
S x M		805.31	6	134.218	20.56*	.0275
	SMR	1840.60	282	6.527		
I x P x M		912.45	6	152.075	28.30*	.0316
	IPMR	1515.35	282	5.374		
I x P x S		84.09	4	21.022	6.69*	.0026
	IPSR	590.43	188	3.140		
I x S x M		167.90	6	27.983	5.33*	.006
	ISMR	1481.51	282	5.254		
P x S x M		774.11	12	64.509	13.49*	.0257
	PSMR	2696.96		4.782		
I x P x S x M		4235.06	12	352.921	64.64*	.1496
	IPSMR	3079.30	564	5.460		
Total S.S.		27860.970				

*$p<.05$

The main-effect Consultation Model (Table 23-1) was significant, F(3,141) = 14.91. The omega-square value for this independent variable was 0.140 . The mean agreement rating of the Collaborative/Process Model was significantly larger than the mean of the Product model (t [141] = 2.78), Prescription Model (t [141] = 3.32), and Affiliative Model (t [141] = 6.74). IDers tended to choose the model that had a collaborative orientation in their hypothetical interaction with clients.

The interaction of system level by consultation models (Table 23-2) was significant (F (6,282) = 20.56), with an omega-square value of .0275. A simple main-effects analysis (Kirk, 1968) revealed that significant differences exist between system levels for the Product Model and Collaborative/Process Model. A significant difference exists between system levels for the Product Model and Collaborative/Process Model. A significant difference also exists between the means of consultation models at the curriculum and unit system levels.

The t-tests carried out to further explain these interactions revealed that the curriculum level, the mean of the Product Model was significantly larger. In contrast, at the unit level the Collaborative/Process Model was significantly larger.

The interaction of innovation type by consultation models (Table 23-3) was significant: F (3,11) = 16.38. The omega-square value for this interaction was .0093. A simple main-effects analysis was carried out. The results of this analysis are reported in Table 23-3 and indicate that consultation models with the instructional strategy and media augmentation innovation types were significant: F (1,141) = 6.47 and F (1,141) = 7.32, respectively. Innovation type each of the four consultation models was not significant.

The results indicate that with an instructional strategy innovation type the Collaborative/Process Model was preferred only above the Prescription Model. With media augmentation innovations, the Collaborative/Process Model was chosen with the Affiliative Model as being appropriate. Therefore, the IDer did not agree that the Product Model was appropriate with media augmentation innovations.

DISCUSSION

It initially appears that the IDer generally prefers the Collaborative/Process Model above the other models of consultation. This is not surprising, considering that such a posture is

Table 23-2. Simple main effects analysis of mean agreement ratings for system levels by consultation models.

Source	df	MS	F
S at Product Model	3	80.90	12.30*
S at Prescription Model	3	24.83	3.80
S at Collaborative/Process Model	3	42.06	6.44**
S at Affiliative Model	3	17.09	2.62
M at Curriculum Level	2	82.14	12.58
M at Course Level	2	8.11	1.24
M at Unit Level	2	114.50	17.54**
Within Groups	282	6.52	

*p <.0125

**p <.0166

Table 23-3. Simple main effects analysis of mean agreement ratings for innovation types by consulting models.

Source	df	MS	F
I at Product Model	3	19.44	3.45
I at Prescription Model	3	2.77	1 <
I at Collaborative/Process Model	3	8.07	1.43
I at Affiliative Model	3	1.38	1 <
M at Instructional Strategy	1	36.46	6.47*
M at Media Augmentation	1	41.26	7.32*
Within Groups	141	5.63	

*p < .025

probably more personally and professionally appealing to the IDer when, as a consultant, s/he can work with a client rather than either giving or taking directions. However, as both the omega-square values and the analysis of the interactions demonstrate, the apparent preference that the IDer holds for the Collaborative/Process Model is hardly as straightforward as this result might suggest.

The direction of the system level by consultation model interaction was contrary to expectations. An instructional development task at the curriculum level was assumed to be complex. It was also assumed that the IDer would engage in a relationship with the client that would help reveal these complexities. This would enable the content expertise of the client and the instructional design expertise of the IDer to be appropriately meshed to solve the curricular problem; hence the need for a collaborative relationship. These assumptions do not appear to hold true for this study: at the curricular level, the IDers chose the Product Model as being more appropriate than the Collaborative/Product Model. At the unit-system level it was assumed that a given task would be relatively simple, thus providing either the client or IDer an opportunity to play a dominant role, depending upon whether the task was content or media-oriented. Again, this assumption does not hold up: the IDer chose the Collaborative/Process Model at the unit level.

The reasons behind these results are unclear. As mentioned earlier, Hoban (1973) reported that IDers concentrate most of their effort at the course and unit levels and the least at the curricular level. His findings, combined with the results reported here, provide some initial insight into the IDer's consultation behavior. At the unit level, the IDer may have felt more "comfortable" in contemplating working with the client because of a familiarty with such projects gained from past experience, and thus used the Collaborative/Process Model. Projects at the curriculum level may be foreign to the IDer. The relative unfamiliarity with curriculum-level consulting may therefore influence the IDer to allow the client to define the problem and the solution by using the Product Model.

It may also be that the IDer does not think it appropriate to question the client's initial ideas because they are so closely tied to the content. Some of this lack of confidence on the part of the IDer may be due to a lack of skills for establishing the relationship. Some support for this comes from Price (1974). In the four phases identified in his study, the introductory (entry) phase contained the smallest percentage of verbal utterances by the IDer.

The results from the innovation type by consultation models interaction is also contrary to those expected. It was assumed that at the instructional strategy level the predominant model would be the Collaborative/Process Model. This assumption was based on the idea that most instructional strategy innovations would be complex and would therefore require a collaborative effort on the part of the client and the IDer. It is not possible to say with certainty which model is preferred. The mean of the Product Model was the highest with this innovation, but it was not significantly different from the Collaborative/Process Model. With media augmentation, when one might assume the Product or Prescription Model to be operating, the Collaborative/Process Model emerged as the model the IDer chose as most appropriate with this innovation type. It does seem strange that with instructional strategy innovations the tendency was toward the Product Model rather than the Collaborative/Process Model. It may be that for the IDers in this study, projects that involve media are more familiar, thus allowing them to work in a collaborative manner.

Based upon the results reported here and the results of the post hoc analysis reported in Rutt (1979), the following conclusions can be drawn:

1. The IDers in this study did not favor a single model of consultation across all phases, innovation types or system levels.
2. The task environment influenced the type of consulting model the IDer chose with the system level exhibiting slightly more influence than innovation type.
    a. When an instructional problem was at the curriculum-system level, and especially if it involved instructional strategy changes the IDers in this study chose to employ the Product Model.
    b. When the instructional problem was at the unit-system level, and it involved media augmentation, the IDers in this study chose to employ the Collaborative/Process Model.
3. The IDers in this study chose to move from a Product Model orientation to a more Collaborative/Process Model orientation in working with the client as the relationship progressed. This was somewhat moderated when the instructional problem was at the curriculum-system level.

Implications

One dimension not "controlled" in the study reported above was that of the client dimension. The type of client could possibly influence the IDer's selection of a consultation model. Coscarelli and Stonewater (1980) have suggested a typology of client styles that may prove useful in studying this dimension. Until this dimension is examined, it is impossible to estimate the effect of the client on the consulting relationship.

It is important to note that the size of the project influenced the model selected by the IDer: at the curriculum level the IDer thought it appropriate for the client to determine the problem and at the unit level the IDers selected a model that would have them working as equals. The reason underlying the selection of a model that allows the client to determine the problem may, in part, be due to a lack of both experience and consulting skills for coping with projects of this scope. The IDer may feel more "comfortable" with projects at the unit level that involve media, and is therefore willing to become more assertive and establish a collaborative relationship with the client.

It is interesting to note that under no circumstances was the Prescriptive Model selected. It would seem that at certain times during the consulting relationship it would be appropriate to tell the client the best course of action. It is possible that this model is used but does not dominate during any phase of the relationship. Why it is not used may be due to some feeling on the part of the IDers that it is not the professional responsibility of the IDer to tell the client anything, or, alternatively, IDers do not feel professionally secure in doing so. One thing is abundantly clear: if IDers are to improve their professional effectiveness, more work is needed to understand the nature and effects of the consulting relationship in instructional development.

Future Directions

Much of the information required for answering basic questions of consultation in instructional development already resides in other fields where mistakes have already been made and blind alleys thoroughly explored. Those in the field of instructional development, with its heritage of eclectiscism, should therefore feel comfortable in borrowing from other fields. In this last section, I will do some "borrowing" of my own and suggest a series of models (frameworks for approaching consultation research. As as result, it is hoped that more organized effort can begin for dealing with what I believe to be one of the more important areas within instructional development.

A Different Perspective

Durzo, Diamond and Doughty (1979) identified "instructional process and developer-client interaction" as one of the major areas of inquiry for instructional development. The topic of consultation in instructional development has, in fact, only recently come under serious scrutiny. Bratton (1980), after reviewing the literature of instructional development consultation, was able to locate only six publications that "discuss ID consultation in terms of either documented theory or research data." He concluded his review by noting:

> There is little doubt that the topic (of consultation) has become increasingly important to the ID field in the last five years. At the same time, our present knowledge can best be described as a mile wide and an inch deep. Much of the writing falls in the categories

> of personal opinion and how-to-do-it approaches. Each writer has selected an areas of personal interest and explored it.

It should not be surprising that researchers would begin by reporting "personal opinions" based upon experiences or approaches that have been used successfully. No endeavor within a new field can be expected to emerge with a clearly articulated framework to guide future research. It is from such "experiences," however, that the construction of an organizing framework may begin. Such a framework may enable systematic research to begin. Argyris (1970) points out that by failing to take an approach that allows for theory building and systematic research as the basis for action, the cost will be to limit the scope of the field to the behavior of the practitioner. To accelerate the building process, Argyris further suggests borrowing from the frameworks of other fields in which systematic research is available.

Sneed and Bruce (1980), for example, have borrowed from the leadership literature. They noted that while the collaborative/process model of consultation is "intuitively appealing," it does not address the human and situational contingencies which affect the IDers decisions to use a certain style or role with the client. They state that the IDer must have both a range of behavioral styles from which to choose and an awareness of situational contingencies that require the application of such a role or style. To accomplish this, the IDer is required to assume "nonstereotypic sex-role behaviors" when interacting with the client. By viewing consulting as a form of leadership, they have come to label such behaviors as "androgynous leadership." Essentially, Sneed and Bruce are suggesting that if IDers adopt this style of leadership, they will be able to respond to client and task situations more effectively. While the effectiveness of "androgynous leadership: is still a question for investigation, Sneed and Bruce have led us to begin considering the consulting process from a different perspective. The history of leadership research seems to point the way for organizing consulting research in instructional development.

Three Models of Leadership

Three models for conceptualizing leadership have successively evolved. These models involve, in varying degrees, four broad categories of variables (Dunkin, Biddle, 1974): (1) prestage - traits, characteristics, attitudes, and expectations; (2) context - scope of tack, resources, sophistication of client, organizational variables, and all other aspects of the situation; (3) process - client and consultant behavior, including the types of questions asked and the nature of their interaction; and (4) product - outcome of the instructional design process including effectiveness of product, perceptions of client and use of resources.

The "trait model" emerged as a result of an interest in attempting to identify certain personality attributes ("traits") that leaders possess (Shaw, 1971). It was assumed that such traits were responsible for much of the leader's behavior. If a number of the traits that contribute to leader behavior could be identified, future leaders could then be selected early in their careers and trained for important positions. This has in fact occurred, though not to the extent hoped for. A number of traits have been found to consistently correlate with certain measures of leadership behavior.

The correlations, however, have been fairly small. Generally, these traits are related to ability, sociability, and motivation (Shaw, 1971). Those doing consulting research might ask if these traits or others, such as flexibility, field dependence and independence, and authoritarianism might correlate with some criteria for the successful IDer. Sneed and Bruce's idea regarding androgynous leadership is certainly a trait that might also be examined.

In the 1950s results from research were beginning to reveal that the idea of leader as a homogeneous role was deficient. It was found that a trait positively related to leadership in one situation was often negatively related or unrelated in another. This lead to the notion that traits and leader behaviors are related to the situation and that who became a leader depended, in some degree, upon the nature of the task (Hollander and Julian, 1969). This evolved in the late 1950s into the "situation model." It was assumed that the situation in which the leader functioned was the primary influence. The main focus of this model was the study of leadership behavior in various settings. These settings were often defined in terms of group tasks and structure. It was assumed that the situation in which the leader functioned was the primary influence. The main focus of this model was the study of leadership behavior in various settings. These settings were often defined in terms of group tasks and structure. It was anticipated that it would be possible to prescribe effective leadership behaviors across a taxonomy of group tasks and structures. However, it was soon found that leader traits and abilities were still important but only to the extent that they were relevant to a particular situation. For those exploring consultation in instructional development, this model suggests a number of questions such as: What is the nature of the projects encountered by the IDer? To what extent does the scope of a task influence an IDer's consulting behavior?

It soon became evident in the 1960s that the trait and situational approaches were too simplistic and static to account for the myriad behaviors exhibited by leaders (Hollander and Julian, 1969). The idea emerged that to properly consider leadership, a more systemic view was needed that considers leadership as a process of social influence between the leader, the lead and the situation. This "interactional model" assumed that neither the leader, the lead, nor the setting were necessarily the prime determinants of leader behavior. Rather, leader behavior was determined by the interactions between these three elements (Hollander and Julian, 1969).

Fiedler's contingency model (1967) is an example of an interactional model. His model is based on the idea that the performance of a group is contingent upon the interaction of leadership style and "situational favorableness." Situational favorableness is defined in terms of the leader-member relations, task structure and position power of the leader. Leadership style is defined in terms of a least preferred co-worker (LPC) score. A high LPC score indicates that the leader has described a least preferred co-worker in very favorable terms. Fiedler found that a leader with a low LPC score performed more effectively when elements of situational favorableness were either very high or very low. This is in contrast to a leader with a high LPC score, who performs more effectively when the factors determining situational favorableness are moderate. Questions the researcher might ask of the consulting relationship using this model would include: with what type of situation and client should the IDer employ strategy X? The research reported in this chapter asked questions that reflected an interactional model.

A Transactional Model

The most recent thinking in leadership research appears to have evolved to the point of the interactional model as found in the work of Fiedler. Sameroff (1975) has noted two additional assumptions made by this type of model: (1) the consultant, client and situation can be defined independently of one another, and (2) any evaluation or classification made regarding these factors will persist over time. If these assumptions can be accepted, then even an interactional model may not be completely adequate for describing the dynamic nature of a consulting relationship.

To give full consideration to the variety of behavior found among and within intrapersonal and environmental variables, it is necessary to propose a model that can deal with processes and changes that will occur during the consulting relationship. Sameroff has labeled this model a transactional model. The IDer consultant, client, and setting would then be viewed as elements that interact through various transactions over time. The consequence of these transactions causes each element to be altered or perceived differently by the other. Kaplan (1978) has provided an interesting example of a transactional consulting relationship within an organizational development setting. Questions asked with this model might deal with identifying the processes employed with certain client types and environmental conditions.

Implication for Consulting Research

Hollander and Julian (1969) have suggested implications for leadership research from a perspective that could be interpreted as transactional. Their ideas serve equally well for those wishing to explore consulting, since they expand on the ideas of the four models discussed above. It is from their writing that some of the following ideas are derived.

In considering consulting, it is important to distinguish between the consultant as a person and consulting as a process with the consultant playing a role in the process. From this perspective, consulting can then be viewed as a long-term influence process which occurs between the consultant and client(s). This process results in the attainment of certain goals within the constraints of a specific setting. These goals will reflect some combination of personal, professional, and task outcomes thought by consultation participants to be appropriate for the consultant, client, and setting. The "setting" in this paper is the physical environment in which the instructional development project takes place. More precisely, the setting is the objective world "outside" that can be described in terms of physical and social variables (Ekehammar, 1974). Two classes of variables in the physical environment are organizational and task. The organizational variable, for example, can be described in terms of factors that may influence the instructional development project, such as desire for change on the part of the organization, available resources for such efforts, and existing reward contingencies. The task variable might consist of factors such as the degree of structure in the design task, the types of changes involved, and the scope of the project. Ekehammar (1974) has suggested that "setting" also has a second component, called the psychological environment. This he defines as the "subjective" world consisting of the individual's perceptions and constructions of the physical environment, which can be described in terms of psychological variables.

The relationship between client and consultant is a process of influence. Such influence is based in various exchanges or transactions in which the consultant both gives something and receives something in return. For the IDer/consultant may in return receive higher status and greater legitimacy, which is essential to the influence-based relationship between consultant and client.

The consultant fills a variety of roles or functions during the course of the consulting relationship. Such roles include: information expert, trainer/educator, salesman, counselor, advocate, and fact-finder (Lippitt and Lippitt, 1978). Clients hold expectations concerning these functions, and the manner in which the consultant's behavior is perceived as appropriate is most likely influenced by these expectations.

These perceptions may have an impact upon the quality of the interaction. Leitzman, Walter, Earle, Meyers (1980) have suggested that it is important that expectations be explored and revealed early in the course of a contract. Interestingly, a number of attributes have been identified that appear to influence how the group leader is perceived. These attributes are classified generally as "demonstrated competence" and "perceived motivation" of the leader regarding the group and its task (problem) (Hollander and Julian, 1969).

Methodology and Conclusion

By borrowing from the leadership literature, a way has been presented for approaching and organizing consultation research in the environment of instructional development. This approach should be considered evolutionary in that each subsequent model builds upon the findings of the previous one. To begin this model-building process will initially require sound case studies that collect data about the IDer-client interaction and the context in which it takes place. The collection of such data will require explanatory concepts to tie them together. According to Brophy (1979), such concepts would serve as "grounded mini-theories" which, after verification, would serve as a basis for correlational studies and more formal experimentation. Bratton (1980), and Coscarelli and Stonewater (1980), have posed questions that, when applied within the models discussed above, should aid in our understanding of the IDer-client relationship. The statistical methods for coping with these questions, and others of a more complex nature, are available. These methods include, for example, multivariate analysis of variance and multidimensional scaling (Ekehammar, 1974). The usefulness of multidimensional scaling for studying individual's perceptions of situations should be considered, but to date, the application of this technique has been limited in the instructional development literature. (See Leitzman, Rutt, Austin, 1980; and Rutt, 1977, for examples of the application of this technique.) It will no doubt also become necessary to employ different models of inquiry than those traditionally used. Naturalistic inquiry (see Guba, 1979; Shrock, 1977) is one such non-experimental approach to be considered which will enable the research to come to grips with the complexity of human interaction in the consulting relationship.

Earlier it was stated that if IDer's are to improve their effectiveness as professionals more work will be needed in understanding the consulting relationship. It is hoped that this last section will encourage others to consider this relationship in a more systematic manner. The end results of such research should provide IDers with strategies useful in dealing with our clients, an increased understanding of the environment in which we work, and more effective instructional systems.[2]

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FOOTNOTES

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IV. LOGISTICS

In military operations, "Logistics" is the name given to those functions performed in support of the combat forces. These functions include supply, procurement, transportation, personnel management, food services, and so on. In instructional development, by analogy, those developers engaged in formulating strategies and applying them to particular aspects of task analysis, synthesis of instructional segments, and so on, could be considered combat troops. Then, by the same analogy, those developers supporting these operations could be considered logistics personnel. Two aspects of logistics are discussed in the following section: Evaluation and Production.

The subsection on evaluation consists of three chapters. The first chapter treats the use of both formative and summative evaluation in the instructional development process. The second discusses formative evaluation in greater depth. The third chapter of this subsection introduces the reader to the naturalistic inquiry approach, which is both a research methodology and an evaluation approach, particularly useful in formative evaluation.

The second subsection deals with production of the materials to be used in an instructional development project. What are the appropriate roles and administrative structures for use with an instructional development team? What decisions should be made, and by whom? Who has final veto power concerning project decisions? This chapter addresses these questions, as well as others.

Many instructional development projects have failed because of a lack of appropriate logistics support, whether of a technical or of an administrative nature. Therefore, such topics as are discussed in this section are of vital importance to an understanding of successful instructional development.

A. Evaluation

24. Evaluation Dimensions for Program Development and Improvement. Eva L. Baker.
25. Formative Evaluation of Instructional Development. Eva L. Baker and Marvin C. Alkin.
26. Naturalistic Inquiry: An Alternative Methodology for I.D. Research. Sharon A. Shrock.

B. Staff Relationships

27. The Instructional Developer and the Media Production Staff: Relationships and Expectations. Lee J. Mullally.

A. EVALUATION

Chapter 24

Evaluation Dimensions for Program Development and Improvement

Eva L. Baker

Evaluation procedures are universally acknowledged as a critical component of any instructional development activity, yet it is often a poorly understood component of the system. This chapter provides information as to analysis of formative evaluation in terms of levels of function and relates types of formative evaluation to the development process. Component, convergent, and contextual approaches to formative evaluation are explored.

INTRODUCTION

Every once in a while it is important to put some distance between common or cherished endeavors and one's perception of them in order to develop what is usually called perspective. People in the field of evaluation seem to take such reflective respites less often or less seriously than do others. Thus, the actors in evaluation seem suffused with a surreal sense of their own usefulness in the large context of educational development. The indisputable merit of the "good idea" of evaluation is rarely contrasted with the meager consequences of the practice of evaluation.

Those who happen upon the infrequency with which evaluation results are employed in educational development enterprises have explanations that are classifiable into two, usually exclusive, categories, political or technical. Evaluation is identified as a political act, and the general spector of "political" is thrown up as the encompassing explanation for the lack of real consequences, or technical improprieties or impurities in the conduct of the evaluation bear the burden for the lack of application. Both explanations derive from shared, and modest, expectations about the usefulness of evaluation. When politics is proffered as the explanation, typical reactions are knowing shrugs and "Isn't it the truth!" laments. When evaluation is seen to falter because of technical inadequacy, naturally we undertake efforts to become more adept technically. Both forms of response demonstrates that many evaluators function at a level they occasionally decry: their concern is more for the process (the doing of evaluations) than for the outcome (the consequences of evaluation activity).

Evaluators are not special in this regard. Given the complexities of our society, people are becoming accustomed to estimating satisfaction from their actual task, (for example, in social service the daily contact with clients, rather than from the long-term benefits of their actions, (how peoples' life-chances change). The long-term benefits appear to be just that: they are too "long-term" and too subject to the influence of the actions of others. Thus, we, in many areas, have given up "tracking" or expecting a linear relationship between our process and its desired or commonly-held outcomes.

Evaluators are not the only ones who have exhibited reliance upon their process rather than upon their outcomes; others have as well. For example, concern for the image of evaluation is also becoming part of the routine rhetoric of full-time policy makers in legislative and executive roles. They know a good slogan when they hear one, and requirements to evaluate existing or developing programs abound in all areas of social action. Endorsing the adoption of an innovation without a formal affirmation of the anticipated utility of a future evaluation is unthinkable. Evaluation is seen as a device to assist public officials in their roles of protecting the public interest. Thus, a program that can demonstrate some actual evaluation component should be considered as reflecting the state-of-the-art at the political, if not at the technical, level.

This increasing dependence upon evaluation as a process separated from its planned consequences exacerbates the complexities of the act itself. For one thing, evaluators are regarded with skepticism. They have assumed tragi-comic social roles of "B" movie time/management consultants--very serious people who are sometimes not taken seriously. Evaluations are thought to expose error. And most normal people choose to defend themselves against public infamy. Although great differences are thought by evaluators to inhere in the common forms of evaluation, with the summative evaluation being a product or consumer report on competing programs, and formative evaluation being an evaluation to "help" the program developer create and improve the product, program developers are not as convinced. Their experience teaches them that the existence of negative data, even those generated in the early phases of program development for the most desirable intents, can be used against the program at some subsequent time. Thus, even within the "problem areas" of development, the image of evaluators as assisting in the improvement of programs has not been taken seriously; evaluators persistently make statements about what is wrong precursive to making recommendations for improvement.

Sensible program directors must find ways to contain the possible damage evaluation might wreak upon their commitment. They can choose to treat the evaluation arrangement as ceremonial, and thus limit its impact in that manner. Or they may reserve the option of discrediting the effort at some later point. The second option is fairly simple to do, given the idiosyncracy of evaluation and the lack of agreement about what constitutes satisfactory practice among those expert in evaluation. Any program director with a reasonable personal or organizational investment is normally wary when evaluators come to call. It is, of course, best when the wariness does not show.

So evaluators have at least two problems endemic in the area of evaluations with which they must contend at the outset. First, they must recognize that the increased tendency to endorse the process of evaluation occurs against a background of little concomitant evidence suggesting that evaluations are actually helpful or useful to various publics. (Evaluators can expect this anomaly to be noticed by others soon.) Second, program directors and members of other program-supporting constituencies have reasons to control the potential negative effects any evaluation, no matter what its guise, might generate.

If we accept that these two problems, exist, evaluators have the right to become somewhat shaky about their chosen line of work. Unfortunately, evaluators contribute to their own difficulties in numerous ways. One principal source of pain is that evaluators have not often attempted to clarify, for themselves, the roles and functions they will assume. Let's concentrate on formative evaluation[1], that type of evaluation which is principally regarded as contributing to the development and improvement of a program. Consider an example with the following set of limits. The evaluation team is working for the development group on a new course in remedial writing at the university level. That is, the evaluation team is separate from the development team. Thus, it is assumed that evaluation information will be generated for use by the program people, who will be making program modifications.

LEVELS OF FORMATIVE EVALUATION

Within formative evaluation, what might be some of the major and minor purposes addressed? At one level, the evaluator can be regarded as a safeguard against corruption, or unintended bias. In this role, the evaluator collects and summarizes information concerning the utility of a program, assuring that embarassing comments are not excised, or dismal data massaged in some way to present a rosier picture. Here the evaluator[2] acts to maximize the accuracy in the data collection, analyses and summary processes. The expertise required is primarily technical. While this use may seen trivial for persons of diverse talents, it represents a common function of many evaluators at present.

A second, more elaborate role for a person/team working in a formative instructional-improvement mode might involve participation in the selection or development of instruments and techniques used to collect information. In our example, the evaluation team would assist the program staff in the clarification of outcomes, and would suggest alternative ways in which they might be operationalized in performance indicators. Choices among tests and measures might be articulated. For instance, the pros and cons of using an indirect measure of writing skill, such as a multiple-choice measure, might be contrasted with the costs and benefits of collecting writing samples and using alternative scoring procedures. Here the evaluators might make comments, or even have the responsibility for scheduling of occasions for data collection and for timing the provision of feedback to the development staff.

At another level, evaluators may also suggest indicators other than those clearly appropriate to the stated goals of the project. In this expansion, they may identify ways of assessing implicit goals, asking questions such as: "Is the course a relatively pleasant experience?" "Does it increase feelings of competence as well as the competency itself?" Further, the extent to which the teachers involved directly in the instruction find the format, content and organization of the program appropriate might also be assessed. The evaluator might suggest the use of observation, interview and questionnaire techniques for collecting this broader band of information. Occasionally, within formative evaluation, the development schedule is leisurely and the evaluator could opt to address longer-term outcomes of the program. For instance, opportunity to collect information on students' persistance at the unviersity, or performance in subsequent classes where writing might or might not be a major requirement, may also be recommended as such long-range indicators. At this third level, the evaluator generates a data base as relevant as possible to the range of information that the program developers can process. The evaluator may expand laterally the kind of data collected, and in doing so, gains considerable flexibility regarding how to weight multiple indicators and how to interpret patterns of support and conflict in the information gathered. The evaluator is still a technician, but must exhibit a good deal of flexibility and diversity in approach. A single-technique person will not do well in this role.

A fourth level of involvement requires much more range. The evaluation team may be expected to make recommendations concerning ways in which to improve activities and their organization, concerning alternatives to present program goals, and, in effect, to become substantively involved with plans for program modification. This is a role in which many evaluators may be comfortable, but it is one which requires not only common technical skills (involving measurement, statistical design, analysis, etc.), but also requires both a logical mind trained in pedagogy and an intimate knowledge of the subject area under consideration. The levels of function in formative evaluation are summarized in Figure 24-1.

When in the program Planner role, formative evaluators may need to tiptoe between the lines of careful analysis and of second-guessing when recommendations are made for program modification. The evaluator must demonstrate that such changes are the best that can be inferred from the data, should indicate other alternatives which have been disregarded, and is expected to use the full range of information collected to explain his or her recommendations. Evaluators rarely attend to their tasks with this level of detail. In those situations where this fourth level is expected, that is, where program-modification decisions are part of the anticipated report, evaluators are often both casual and speculative. And thus, this level of evaluation must be approached with great caution. Is the difficulty in this role simply a matter that, as usual, power (in this case, to change a program) corrupts? Is it simply a matter of finding a competent team which embodies the full range of skills required or producing substantive recommendations for the program? If the impact of the evaluation is to be more a matter of intent and less serendipity, another dimension must be explored. We must attend to what is a legitimate and proper function of the evaluator (as opposed to the creater) of educational programs.

EVALUATION FUNCTIONS

One way of trying to understand the evaluator's functions in the broadest sense is to look at them at a relatively high level of abstraction. Consider as an illustration the problem of understanding and verifying reality in the physical sciences. When techniques were few, and physics was the product of the relatively casual observation of and thought about natural events, attention was focused upon why something occurred. Philosophers wanted to understand. Analysis was under-

Figure 24-1. Levels of function in formative evaluation.

Level	Function	Role
1	Data collection, verification analysis report	Assistant to developer
2	Selection of measure + above	Assistant to developer
3	Generation of indicators, + above. Interpretation of data conflict	Collaborative
4	Recommendations for program revision, hypothesis generator + above.	Program planner

taken to develop casual links, albeit with little if any technical support. Aristotle wanted to know why the world and the heavens related as they did. As people developed more sophisticated techniques, they became interested in quite another level of analysis. They were concerned with relationships and processes. Newton and the physicists who followed him were attentive to how events occurred. They posited relationships and watched to see if they were correct. They forsook the understanding of higher order in return for predictability. Within the revolutions which have occurred and are occurring in natural science in the twentieth century, expectations continue to change. Our technological process has increased, for instance, in the use of devices to magnify and extend our perception of reality beyond imagination. We are at once, therefore, engulfed by information. Our refined data-collection techniques have demonstrated that the Universe is exceedingly complicated and consists of an extraordinary number of components, each of which would take lifetimes to unravel. As the means for observing reality have grown through technology, the grandeur of our questions has become reduced. Einstein and those who followed him have shown themselves to be interested in what is happening, as a point of departure, rather than the more ambitious questions of how and why. Simply finding procedures for the adequate description of events is an acceptably important first step. Positing casual and predictable relationships are tasks that are simply too hard. In reflecting upon the transition among the questions of why, how and what in physics, it seems that the parallel in educational evaluation might also be articulated.

Formative evaluators who attempt to link data with their recommendations are functioning at a Newtonian level of analysis. They think they can understand how processes are related to outcomes. One might properly argue, however, that the educating of people is exceedingly complex and that the possible relationships among processes are similarly entangled. For example, under experimental conditions, it has been shown that people can improve program performance by using tryout data for revising instruction (Baker, 1970; Rosen, 1968, Gropper and Lumsdaine, 1961). Yet in these studies, the analysis of other interesting variables was not undertaken, for instance, practice effects might appear to be a reasonable alternative hypothesis (the practice gained by the program developer extending his or her experience through another program revision effort). The attempt to isolate causes is mechanical, in the Newtonian sense. The level of technology is sufficiently developed in evaluation, that is "why" questions are no longer considered of primary interest. Thus, evaluators in formative evaluation roles do well to concentrate upon producing careful descriptions using the full range of technologies at their disposal in order to help people understand what has happened. They might also "polish up" the same explanation when peole ask whether the act of evaluation is actually related to improved programs.

This section has attempted to treat dimensions important to the conduct of formative evaluation. Dimensions of importance include the expectation of utility from the evaluation, and the likelihood of obtaining cooperation from others who have commitments to the educational program under scrutiny. It also included a discussion of the roles which formative evaluators adopt, from the technician to the hypothesis generator recommending program modification. A focus upon good description was suggested, and the point was illustrated through the transmutation of the roles of physicists, from the search to understand the meaning of events, to the desire to explore casual relationships, to the present concern with describing well the events that occur.

A recipe for good formative evaluation is offered. The evaluator must function at a level above that of being a mere technician. Alternative sources of data should be generated, but the limits upon the data-collection enterprise must be determined by the dimensions of control and timing. Data should be collected for those elements over which the program has some control. (For instance, demographic information is probably unimportant unless the program would be available differentially to various student populations, or unless alternative forms of training on program implementation were planned for different user groups.) Timing most simply means that the data must be generated in time for the program developer to do something with the information. Frequently, elaborated data-collection and analysis routines overlap with development schedules. When program development is fixed by special budgets then the insistence upon timely data collection is necessary, and the extent of description must be limited.

If the evaluator could choose to focus on a level of analysis appropriate both to their roles and to the available technology, then the ultimate form of the evaluation in program development is determined by the elements, such as the type of program to be evaluated and the form of development through which the program is proceeding. It may be antiquated to continue to discuss formative evaluation as if it were a single process; it is true that basic conventions for formative evaluation exist. But how did the codified idea of formative evaluation develop? Evaluation strategies for program improvement evolved largely because of the importance of verification in early small-scale program development efforts. For example, a basic statement of technique was prepared by Markle (1967). She described the steps in formative evaluation as beginning with small numbers of students working through a segment of instruction, through large samples of learners and expanded sections of programs and ultimately to "validation" samples where the final program would be used in "natural" conditions. Such strategy was appropriate because of two facts. First, the programs which Markle and others has in mind were materials-intensive. That is, students were exposed to self-contained materials in which the developers' influence was intended to be concentrated. Instruction was not complex, at least in form of administration. Mediation of instruction by live interpreters, such as teachers, was only an occasional feature of the instruction. What was then known as "programmed instruction" was the basis for this orientation. Second, the fact that the developer, or at that time, more properly the behavioral psychologist, was directly responsible for the instruction transmitted to students and for setting the rules by which data were to be analyzed. For example, issues of stimulus control were paramount. Data were collected to determine precisely the location in the program where more cues should be added in order to control student in-program responses. Performance outcomes were analyzed specifically to determine the place in the program where failure was occurring. Characteristics other than the psychological requirements of instructional design were only vaguely important. This assertion can be verified by checking the great number of misinformation and content errors in early examples of programmed instruction. Usually, although not exclusively, the first instructional programs were directed to the development of verbal repetoires, skill learning and rudimentary concept formation. The manner in which the instruction was to be organized within the network of other offerings in the school day was usually not considered.

Even when the scope of interest changed from programmed instruction to instructional development, the attributes of rcommended formative evaluation procedures carried their behavioral psycho-history. In this manner, formative evaluation has been characterized as requiring, by some, one-shot case study designs (as described by Campbell and Stanley in Gage, 1963), iterative engineering cycles, focus on student outcomes, and sample sizes range from two or three to multiples of the appropriate implementation units, e.g., multiple classrooms of students. A review of formative evaluation was reported by Baker and Alkin, 1973. Even in recent renditions, this orientation is dominant. The focus for evaluating first is in developing information sets about instructional design properties and then in extending and testing those designs with the full range of students and implementation sites. Data elicited from the teacher in many formative evaluation studies is related to their roles as conceived by the developer, as reincarnate of the behavioral psychologist. In the desire to transmit communication which as is as free of noise as possible to the student, the teacher is seen as a mediator, or really the medium, in the same sense as slide/tapes are medium through which presentations are made and stimuli controlled. Data are to verify that the teacher conformed to expectations.

Formative evaluation of this sort predominates in the field. Yet, it is clear that it is pertinent to only those development strategies which focus on refining segments in small numbers and extending work to large elements of program and subjects. This kind of formative evaluation we will call COMPONENT formative evaluation because it is based on incremental stacking of program components.

Alternative strategies of development call for varied formative evaluation styles. Another type of development, a delivery system strategy, is very different from the additive, linear development just described. In a delivery system orientation, the first problem for the developer is to visualize the final form of program operation. Product formats, design, training, the full variety of elements to be manipulated in the range of desired implementation settings are the first order of business. The ways in which teachers, students, materials and other support systems cohere into an operating program is established after an overall, operational system is functioning, then more refined instructional design elements are substituted into this operating sysem. Rather than conduct product testing on the instructional design, more traditional forms of experimental research are conducted on instructional variables of interest, e.g., response mode or number of examples. The critical feature of this approach is that this research can proceed in relatively traditional uncomplicated ways because it is not its purpose to determine how the findings relate to conditions of use. The verification or the formative evaluation, proceeds in two ways. One strand addresses the development of the operating system; and a second research activity parallels this effort. Only at the point where the researched instruction is substituted into the product system is more traditional formative evaluation of instructional elements a serious focus. For that reason, it is termed CONVERGENT formative evaluation. This form of evaluation has not traditionally been the orientation subscribed to in instructional development. The progression is not from laboratory to natural setting as in the Component form above. Rather, concern for the natural setting begins at the outset. Only when moderate confidence is reached for both the operating system and the instructional design elements do the pieces converge. While this orientation may seem to oppose in many ways programmed instruction, it does preserve one of its basic strategies: backward chaining. In programmed instruction (Gilbert, 1962) suggests that the best way to treat a problem was to approximate the final solution, e.g., tying a shoe, and decompose the necessary behaviors from that point. The learner is intended to develop a overview of what the final outcome is planned to be. A delivery system approach to development is similarly closed rather than open-ended. It is also probably much more efficient. Both Component and Convergent forms of development call for commitment to data collections for evaluation and research purposes, and to programmatic and secure periods in which to engage in the task.

Unfortunately, many "innovative" programs, especially those funded through large scale State and Federal efforts have neither a focused, programmatic effort behind them, nor a protected period for research and development. These are diffuse programs and they are public issues as soon as the legislation is signed. They appear to succeed or fail primarily because constituencies in support or in opposition to the program are effective. Evaluators are often sought to assist in consensical judgments or at least to provide guidance to responsible policy makers on whether these programs are working and how they might be improved. In these cases, program guidelines are usually very general, a necessary attribute to accommodate to the full range of implementation sites and to the dominant notion of local control of innovation. Immediately, the idea of finding identifiable attributes of a program, except on the grossest levels, evaporates. The program description may consist of platitudes plus findings, plus considerable but enormously varied forms of effort. Finding dependable outcomes measures is easily as difficult as finding the "program process" itself.

In this case, the evaluator recognizes that the program evolves, and understands that the signal-to-noise ratio will be difficult to determine. Further, political instincts will be exposed and sensitivity to evaluation is likely to be high. For these reasons, the previous strategies of Component or Convergent formative evaluation are inappropriate. What the evaluator must do is to gather good descriptive information on the full range of outcomes and processes available. He or she should not attempt to limit sample size, except for economic reasons, but rather should take pains that the sample is truly representative of the range of settings in which the program is expected to operate. Fine-grained analysis and speculations of hypotheses to explain any findings may be developed through case study efforts, which are used to: 1) verify broad based data collection, and 2) provide a narration for policy makers on what kinds of things are actually happening in a integrated sense. Regression analyses of process and outcome data may generate hypotheses for further refinement, either through a smaller scale targeted study, or for quick and dirty planned variation in successive years of funding. The evaluator recognizes the great force of the ecology of the situation, including political and sociological factors. In this regard, the formative evaluation is CONTEXTUAL in nature, for context is expected to create maximum effect. An example of Contextual formative evaluation is the Evaluation of the California Early Childhood Education Program (see Baker, 1976, Baker, Herman, and Yeh, 1977). Figure 24-2 represents a summary of this section.

SUMMARY

Formative evaluation procedures should be matched to the development process in which they are embedded. Attempts to use formative evaluation methods of the Component type for development efforts that are contextual in nature will result in mismatched expectations and outcomes. The evaluator, once again, may have allowed his or her commitment to or experience with one form of

Figure 24-2. Types of formative evaluation and development process.

Development-Features	Developer Control	Formative Evaluation Type	Evaluation Features
Laboratory to Natural setting; incremental	High	Component	Interactive cycles, expansion of sample sizes
Operating system embedded in natural setting; parallel research on instructional design integration of both systems	Medium	Convergent	Controlled experiment research--formative evaluation of operating system
Highly diffuse and political programs; broad based, local options. Natural setting throughout	Low	Context	Broad representative sampling, regression analysis of process and outcomes

evaluation to color findings. Evaluators must begin to acknowledge that some of the early conceptual distinctions drawn for evaluation activity only poorly serve the full range of roles that evaluations are expected to satisfy. Perhaps the recognition that there exists component, convergent and contextual approaches to formative evaluation will allow our responsible growth as contributors to the improvement of education.

NOTES

[1] Although the distinction between formative and summative evaluation, as identified by Scriven (1967), was exraordinarily helpful, summative evaluation seems most appropriate in the preparation of discrete and clearly identifiable programs, such as specific products or product systems. I find the notion of summative evaluation less useful in connection with the existence of broad-based, broadly funded "programs" such as ESEA Title One. Although evaluations in this case are undertaken with a "summative" intent, clearly the program would continue to exist in some form and thus all data are to be used formatively.

[2] I use the term "evaluator" throughout for convenience. I am usually refering to a function rather than a single living, breathing body. In the same loose way, I might term "developers" those people with responsibility for development. This prose convention should not convey the notion that the competencies implied by either development or by evaluation tasks should reside in single persons. I am indebted to Richard E. Schutz for a seven-year conversation on this point.

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Chapter 25

Formative Evaluation of Instructional Development

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Research in the area of formative evaluation is presented in this chapter. The inadequacy of current formative evaluation procedures is pointed out. The chapter indicates that we are currently in an era of seers and clairvoyants in terms of formative evaluation, and provides suggestions which might lead to the evolution of formative evaluation into the domain of scientific application.

Substantial amounts of money are wasted each year on the purchase and installation of educational products which later prove to be inappropriate or ineffective. To prevent such economic and educational waste, and the negative effects it could have upon the future acceptance and use of educational products, and at the same time improve the products ultimately produced, developers should engage to a greater extent in formative evaluation of all products. These formative evaluation data would provide information to developers which would allow them to modify and improve their products before they are distributed.

The inadequacy of current formative evaluation procedures in the development of products has been well documented by Komoski (1971). He notes that less than 1% of the approximately 14,000 textbooks being sold are "systematically shaped through the learner try-out and revision process"--utilizing formative evaluation data for product modification. Komoski states that the situation is worse in the field of the educational film. In the area of broadcast video-taped instruction "only a little over 1% of the television materials used in schools has been learner verified" (Komoski, 1971).

Even in the area of programmed instruction, the area in which the basic techniques for learner verification through formative evaluation and revision were developed, the situation is discouraging. "EPIE's examination of 633 of the programmed items now in use in major curriculum areas in schools revealed that research evidence was available for only 7% of these materials while some field testing was claimed for another 8%" (Komoski, 1971).

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Deficiencies in the use of formative evaluation procedures as a part of instructional product development are not new and have been known for years. (Komoski, 1956). Apparently there is great willingness on the part of publishers of instructional materials of all types to turn their heads, make believe the malaise does not exist, and hope that, like the mumps, it will pass with time. Now, let us consider what is meant by the term "formative evaluation."

FORMATIVE EVALUATION

Other publications (Alkin, 1969), have referred to the purpose of evaluation as the provision of information for decision-makers and have maintained that "evaluation must take into consideration the ultimate decisions to be served." One classification of ultimate decisions was suggested by Scriven (1967), who made a distinction between formative and summative evaluation. Generally, formative evaluation is used to describe the evaluation of educational programs while they are still in some stage of development. Schutz (1970) has said, "the product of formative evaluation activities is expected to be an improved instructional program." Or, to state the definition of formative evaluation somewhat differently, formative evaluation is intended to provide data for instructional product revision, as opposed to summative evaluation, which is to provide data for product validation.

This distinction causes us some concern. Technically, we cannot conceive of a summative evaluation taking place with respect to instructional product development if, as is frequently the usage of the term, one considers that summative evaluation refers to the last major evaluation effort related to a product prior to its public release. Let us assume, then, that the intent of summative evaluation is to validate the materials. Can we say that, following this validation, not an idea, not a paragraph, not a phrase, not a word will be changed, and that the published product will be identical in every respect to the "validated" product? The strict definitions of formative and summative, therefore, seem to preclude the possibility of a summative evaluation taking place.

In this regard, we like the Stake (1967) distinction between formative evaluation and summative evaluation. Stake notes that "It is probably more useful to distinguish between evaluation **oriented to** (authors' italics) developer-author-publisher criteria, and standards and evaluation **oriented to** (authors' italics) consumer-administrator-teacher criteria and standards." Thus, with respect to the evaluation of instructional products, we may make the distinction between formative evaluation, evaluation **oriented toward** developers in order to provide them with information to be used in modifying and improving programs.

From this definition, it is obvious that a large part of the activity of product development deals with formative evaluation. Indeed, the role of the evaluator is generally not unique nor separate from his role in performing the activities of product development. In fact, formative evaluation is an inherent part of the product developer's role. Because product development and formative evaluation go hand in hand, they are frequently performed by the same people. In many cases, the supplier of this information, the evaluator, is also the developer. That is, the same individual has a dual role in the product-development process. As a result, the evaluator selects and supervises the product's field-testing plan, and translates the information he gets from the tests into product changes.

Thus, it is important to note that when we refer to "the formative evaluator" in product development, or to formative evaluation data, we are referring to an evaluative function or role that could be performed by the developer himself. This overlap of function may cause some difficulty in separating "research on formative evaluation" from "research (more generally) in product development." The next section will deal with this issue.

RESEARCH ON FORMATIVE EVALUATION

Difficulties in Doing Research

Attempts to apply formative-evaluation procedures greatly outweigh any systematic research investigations into the critical factors for conducting formative-evaluation work. This lack of experimental research into the process of evaluation should surprise no one. Research on "research" and research on "development" have been sparsely-supported activities, and research and development enterprises have longer histories and wider practice than the evaluation activities.

In order to conduct research on evaluation (or on research or development), a combination of ideal conditions in a real-life project must exist. There must be investigators who think that knowledge about the process of evaluation, for example, will be important or useful. There must be individuals who can and will defer their single-minded concerns for their mission objectives in order to design studies which more leisurely compare systematic variations in process. There must be support that permits the conduct of parallel treatments over a length of time sufficient to establish differences. Resources of such a magnitude are not often available.

In addition, a number of methodological problems impede such work. Methodology, research on evaluation might require, for example, in the simplest case, comparisons of evaluations that systematically include procedure S with evaluations that exclude it. As sufficient number of the evaluators must conform to each treatment variation, so that in effect of the variation, rather that the evaluators's finesse, is tested in the research. Given the wide variety of different educational programs and systems, and the usual idiosyncratic behavior of those called upon to be evaluators of programs, it is not very surprising that little real-life research has been done on evaluation.

The alternative to research conducted in the course of real projects is to use simulated settings for research studies. However, the use of simulated settings requires the investigator to make serious sacrifices in verisimilitude. For instance, graduate students are likely to be the group most readily available to serve as research subjects in simulated settings, for the possibility of obtaining "real-world" evaluators as participants in such experiments is usually remoted. There are several reasons why bias might be introduced through the selection of students as research subjects. One reason is that student-subjects are more likely to conform to treatment requirements than are practicing evaluators, who might not agree with the particular treatment variation to which they would be exposed. Moreover, student-subjects also lack real-world experience in evaluation--they also are usually well-protected from the administrative-personnel concerns that plague many on-the-line evaluators.

Another problem relative to the use of simulated settings is that the scope of the problems provided for a student to solve necessarily is often much narrower than is the scope of the problems confronting a project evaluator. The nature of the simulated setting requires the selection of a small number of manageable and easily manipulated dimensions thought to be indicative of the major aspects of the real-world setting. Studies have been conducted, however, in the area of formative evaluation, and have been subject to almost all of the deficiencies noted above. Since the issues addressed in this research have high potential payoffs, it may be far better to endure the possible deficiencies of the data collection strategies than not to conduct the research at all. The conduct of such studies may be viewed as valuable despite the caveats that should accompany the findings.

Most of the research on evaluation then, is subject to the limitation of having been conducted in contrived and usually simulated settings. The major areas of investigation of such studies can be categorized as primarily dealing either with (1) the manner in which data are gathered or (2) the use of formative evaluation data.

If one agrees that the task of the formative evaluator is to monitor programs in order to provide evaluation data leading, hopefully, to improved results, then it is not surprising that the focus of most research on formative evaluation has been at the data acquisition/utilization conjoint. The two major research questions related to formative evaluation are: (1) What are the major types of data to obtain and the major sources of such data? and (2) What is the impact of evaluation data upon the modification or programs?

Studies of Data Gathering

In order to assess the effectiveness of instructional systems, a variety of data types may be investigated. We will discuss those data types most frequently used in research efforts. At a subsequent point in this chapter, alternative data types for formative evaluation will be suggested. Among the most prominent information-bases for instructional improvement is the learners' criterion test performance. The extent to which learners have mastered the objectives of a given instructional sequence is one critical ingredient in the judgment of program effectiveness. Effects of instructional programs have typically been measured by objectives-based instruments such as those advocated popularly by Mager (1962) and subsequently articulated by Glaser (1963). These measures typically have been oriented toward the achievement of cognitive goals.

A coordinate and very popular source of data utilized in the formative evaluation of instructional programs is the within-program response, assessed by recording students' answers to problems they encounter enroute to the desired goals. Another important source of data are learners' attitudes. These attitudes are of several types: (1) toward the subject-matter itself, that is, how much they like mathematics; and (2) toward the instructional process, that is, how interesting they found the sequence. These are each significant sources of post-instructional effects. Attitudinal data may also be obtained by recording positive and negative responses made in the course of the instructional sequence.

Another important category of formative evaluation data we refer to as implementation data (Alkin, 1969); this relates to whether the instructional system under development is capable of being utilized in the specified way. The more complex the instructional system, the greater the need to ascertain its implementability. For example, an important implementation-evaluation finding would be evidence that an instructional system requires combinations and sequences of ancillary support materials that are either not likely to be available or are not likely to be mobilized and synchronized in the manner appropriate.

Within-Program/Posttest Performance

Although there have been many recommendations regarding the sorts of data to collect in program development (see Baker, 1973; Markle, 1967), research on data gathering has centered upon the consideration of cognitive achievement. One area of high concern among researchers has been the relationship of within-program responses to posttest performance. In part, this concern may be attributable to the fact that data was readily obtainable and quantifiable. When one recognizes that early research was in the field of programmed instruction, just once removed from operant conditioning, it is easy to understand the research emphasis upon within-program responses.

The response rates, or error counts, in a learning sequence were thought by some to be a direct indication of the ease with which learning occurred, provided, of course, that the responses made during the program were congruent with the intended outcomes of the sequence. Theorists in programmed instruction differed regarding the intended function of errors in a learning sequence. Glaser (1966) suggested that within-program errors represented an inadequacy of the program itself; Crowder (1960) saw errors performing a diagnostic function, indicating what particular discriminations needed additional attention.

A series of research studies attempted to determine the relationship between response rates and criterion performance. In three separate research investigations, the relationship between errors and criterion performance was not found to be reliable. Silberman, Coulson, Melaragno, and Newmark (1964) manipulated errors without affecting criterion performance. Anderson and Faust (1967), in a study involving programmed instruction, observed the relationship of errors to the manner in which the questions were presented, and suggested that errors were not necessarily related to criterion behavior. Baker, Schulz, and Sullivan (1967) conducted a study in which low error rates (high numbers of correct responses) did not necessarily predict strong posttest performance.

From the present vantage point, one is not at all surprised at the findings of Silberman's, Anderson's, and Baker's studies. The studies were conducted on materials which were "programmed" according to the standards of the day. They represented a single development team's notions of sequence and design. At that time, little work had been conducted in assuring that both practice and criterion examples were drawn from the same item population. Thus, it was very easy to design simple practice items, items which were often susceptible to sequence prompts, and thus were not necessarily at the same level of difficulty as the criterion items. Further, the notion of domain-referenced testing, as described by Hively, Patterson, and Page (1968), Hively, et al. (1973), Baker (1973), and Millman (1973), had not surfaced in the formative-evaluation literature. Test design was enmeshed in the rituals of norm-referenced item construction and item improvement. Idiosyncracies in item design prevailed. So the lack of congruency of performance on within-program problems and criterion exercises was to be expected.

Posttest Data

Criterion test performance has nonetheless served as a basis for inferring program success or revision requirements. Unfortunately, little research has been conducted regarding the form and frequency with which such posttest data should be collected. An advance in program assessment strategy has been the work in matrix sampling. Husek and Sirotnik (1968) have described a procedure for reducing the amount of testing time requisite for program revision. Samples of test items are administered to samples of learners, and the sum across all items is used as an index of program success. Shoemaker (1972) has prepared a refined and expanded paper on the topic, describing multiple-matrix sampling, where samples of item-person matrices are repeated across time. Shoemaker demonstrates that such procedures are superior to usual non-sampled test administrations in terms of the obtained standard error of estimate, and no worse than regular procedures in terms of the bias of the data. Such procedures are particularly appropriate when student time is at a premium and a set of coordinate objectives may be assessed by the developer.

Fortunately, multiple-matrix sampling procedures are useful even when task hierarchies, or objectives requiring a sequence of particular subskills, are to be assessed. The item sample must be stratified so as to provide each learner with an entire hierarchy, suppose, of a terminal objective and two enabling or subordinate objectives. Without stratification, matrix sampling would be of little use for the prescriptive revision of the instructional sequence under scrutiny. Gagne and Paradise (1961) conducted research that generated hypotheses to explain unachieved criterion objectives. Using a hierarchical explanation of learning, they suggested that failure in criterion performance may be attributable to (1) the omission of subordinate learning; (2) lack of retention of a subordinate skill because of insufficient practice; and (3) inadequate instruction to permit the integration of subtasks.

Number and Use of Subjects

Another interesting research question relates to the selection of sample subjects to be used as a data source for various formative evaluation efforts. There are advocates of the tutorial model involving formative evaluation data obtained from single learners in linear fashion with repeated tryouts. There are advocates of the large-group model involving formative evaluation of the prototypes with larger samples that are more generally representative of the intended target population and employing more sophisticated measurement and analysis techniques. Others have suggested the use of small-group try-out in conjunction with debriefing sessions.

A study by Robeck (1965) was designed to test the feasibility of the use of a single student as the data source for formative evaluation leading to the revision of an instructional program. An initial program revision was based upon the reaction of a sixth-grade boy, and the second revision was based upon another individual reaction. Three versions of the program (the prototype, revision 1, revision 2) were then administered to three matched groups of students. The performance on the two revised editions was significantly better than that on the prototype, although the performance on the second revision was not found to be superior to the performance on the first revision. This study demonstrates that observation of a single student is an economical method for significantly improving instruction; its difficulty, however, lay in developing procedures for selecting "an appropriate student." The use of a single student was employed by other product developer/evaluators as well (Fleming, 1963; Markle, 1967) to mention but a few.

In a variation of the single-student procedure, Abedor (1972) used a small group combined with a debriefing session. Revisions based upon his formative evaluation procedure produced statistically significant outcome results over prototype material "on 9 out of 12 dependent measures in three separate field experiments." This is perhaps a not very startling result. As an interesting by-product of the study, the analysis of the data suggested that obtaining feedback through procedures utilizing a student debriefing session may serve as instructional product development training. The effect of such "training" may result in improved quality of subsequent prototypes directed at the same target audience; however, Abedor presents no data to support his supposition.

A question that persists and that is of continued interest to those engaged in the development and formative evaluation of instructional systems is the question of timing for the employment of the various data sources. How polished must a prototype version be before it is submitted to formative evaluation? This question has been raised by many writers, including Gilbert (1962), Markle (1967), and Rummler (1965) et al. In discussing formative evaluation of films, Hovland, Lumsdaine and Sheffield (1949) have noted:

> "The stage at which evaluative research would appear to have its greatest potentiality for product improvement is well prior to the completion of a film, when suggestions derived from research can readily be incorporated into the final film production." (P. 259).

Use of Formative Evaluation Data

Since revision of instructional materials based upon formative evaluation data rests at the heart of instructional development, there have been a series of research studies conducted by those engaged in instructional technology and development that examine the use of formative evaluation data. The explanation for most of these studies is that they attempt to justify the time needed and cost spent in revision. A study involving instructional television was conducted by Gropper and Lumsdaine (1961) in which, on the basis of criterion data on a set of instructional lessons, revisions were made. They report improved learner results from revised material when experimentally compared with the originals. Three studies using film-strip mediated instruction, VanderMeer and Montgomery (1964), VanderMeer and Thorne (1964), and VanderMeer (1964), supported the use of evaluation data to improve instructional effects. VanderMeer, Morrison and Smith (1965) later used achievement data as a basis for the revision of two films.

The above-cited studies, and others of a similar nature, confirm one's common sense expectation that finding out something about program effects will improve one's next efforts. That is, formative evaluation data have been shown to make a difference in product performance. However, there are a number of reservations regarding this research, based, in part, upon the state of development of the technology of instructional revision at the time of the studies. For one thing, the studies above are unalterably confounded, in that single individuals or teams used the formative evaluation data for revising the materials. Thus, unarticulated, unintended bias might have enhanced the revision versions. For a second thing, there was little evidence that the revisions made in these studies were controlled by the formative evaluation data (either the types of data collected or the pattern of responses obtained). The studies merely demonstrate that, after collecting some formative evaluation data, someone did something to improve a single instructional sequence. A serious issue in this research, then, is the lack of generalizability of the findings. How can we demonstrate that researchers other than the particular experimenters can obtain results favoring empirical methods? How can we demonstrate that it is the formative evaluation data that have impact upon improved program performance rather than some other variable, such as simply increased time to consider the material?

A particularly interesting line of research,, pertinent primarily to the question of generalizability, was established by Rosen in a 1968 study. Rosen employed the programmer as the experimental unit. Two groups of programmers were randomly assigned to experimental treatments. Both groups were given the same instructional materials and asked to improve them. One group was given formative evaluation data from tests of the program objectives given to a group of learners. The second group was given directions to use any criteria they wished to revise the program; they were not provided with evaluation data of any sort. The "improved" programs were then administered to randomly-assigned sets of learners. Student performance on both sets of revised materials was found to be superior to that achieved on the posttest of the original, unrevised, program. The performance of the program revised on the basis of formative evaluation data was found to be higher than that of the intuitively-revised programs.

Variations of the Rosen study have been conducted. Sulzen (1972) used programmers as the experimental unit in a study using five revisions, each of two different programs. Baker (1970) used seven different instructional programs in her study.

Each program was written by a different person and tried out on three learners. Programs were then randomly reassigned to writers along with formative evaluation data on the program they were to revise. After revisions were made, the programs were randomly assigned to subjects, following the model demonstrated by Rosen. Obtained performance differences favored the revised versions of the programs.

While the above studies provide gross information the impact of formative-evaluation data upon revision is still obscured. What does or should the program writer do with formative-evaluation data? In what form should formative-evaluation data be provided? What rules are there to guide the way in which developers might use such data?

The study by Baker (1970), previously cited, attempted to provide rules for developers to assist them in making use of formative-evaluation data. However, this study did not experimentally control for the use of these revision rules. A later study by Robinson (1972) trained programmers in the use of revision rules. Students who used revisions prepared by the trained revisers achieved a significantly higher mean than did students who used revisions prepared by untrained revisers. These studies both focus upon the training of product developers to use formative-evaluation data more effectively for revision purposes.

The question of the kind and level of formative-evaluation data that should be considered satisfactory for moving a potential instructional product to its next stage of development is one which has not been examined to any extent. Edmonston, Kunetka, and Newman (1973) performed a study in which they examined the question of whether or not evaluators and product developers agree as to when a product should be advanced from one developmental stage to the next and whether or not they rely upon the same sources of data for making that decision. In 21 simulated situations, descriptions were provided of a program in a specified stage of product development. Five product developers and five evaluators were asked to decide, on the basis of cost, performance, and spin-off data, whether or not the program should be allowed to progress to the next product developmental stage and which of the three indicated data sources were relied upon most and least in making this decision. Both groups rated the importance of three data sources similarly at each of the stages. Interestingly, evaluators seemed more willing to allow products to proceed to the next developmental stage at the early stages of development. While the study has too small a sample to provide significant empirical data, it does serve to remind us of the potential utilization of the more sophisticated JAN methodology (Christal, 1963) for "capturing the policy" upon which individuals base their decisions. The Christal use of regression techniques for this purpose might be most appropriate as a tool for research on formative evaluation relative to revision decisions.

In related research, Dick (1968) conducted a study in which he determined the functional state-of-the-art in revision. In essence, his study dealt with the question of how evaluation data were used by revisers and what kinds of evaluation data were used in making decisions. In his study of revisers' behavior, Dick found that revisers attended to reviewer comments and error rates within the program, and infrequently looked to performance on the posttest as a source of data for revisions.

Another line of research is represented by a study conducted by Bank (1972). The research issue is whether the collection of formative-evaluation data interferes with the learning of subjects. In the treatment conditions, subjects, who were classroom teachers engaged in an in-service training program, were requested to respond during the course of instruction to two-page questionnaires concerning the value and effectivensss of the product. The outcome measures for both treatment and control groups were a cognitive posttest and an attitude measure. Her findings suggested that learning was not depressed by the inclusion of questions relating to the clarity of presentation, suitability of examples, etc. Her findings were partly replicated by Baker and Quellmalz (1972).

FORMATIVE EVALUATION MODELS

In this section of the chapter we will examine various formative evaluation models and consider their appropriateness for use in the evaluation of instructional products. We will focus initially upon the formative-evaluation components of total models and upon formative-evaluation procedures that are derived from a broad conception of evaluation. Later in the chapter we will consider procedures which are built into instructional product-development models or which are derived primarily from an instructional product-development point of view.

Evaluation Models

Within the field of evaluation, if one will consider Scriven (1967), who coined the term "formative evaluation", as the father of formative evaluation, then surely Cronbach, who said "the greatest service evaluation can perform is to identify aspects of the course where revision is desirable.," (1963) must surely be thought of as the godfather. The efforts first of Cronbach and then of Scriven turned the eyes of the field of evaluation to a concern for evaluating programs in order to make revisions and attain improvement. Scriven (1972) and Stake (1972) imply that it is best that the formative evaluation be performed by an agent external to the program. Scriven calls his approach "goal-free evaluation" and establishes a rule in which the formative evaluator collects her or his own data and renders his assessment of the actual effects of the project. The evaluator operates without knowledge of the claims made for the program by its developers. Thus, no statement of purposes, goals, or objectives are admissible data for Scriven. The evaluation proceeds without coercion of documents. The counterpart of "goal force evaluation" is called "responsive evaluation" by Stake. Like the goal-free evaluator, the responsive evaluator is primarily external to a program or product-development activity, and therefore has a certain independence and objectivity that is presumed not to be present in an internal evaluator. The formative-evaluation role portrayed by both Scriven and Stake is in many respects analogous to that of a financial auditor who enters the scene, makes observations based to some extent upon guidelines but heavily upon her or his own choosing, and, by making evaluation observations kown, manages to assure the stockholders that either all is well, or that improvements are underway, or, at minimum, that some irrefutable source is keeping the system honest.

Extrapolating from the writings of Stufflebeam (1971) and of Alkin (1969), one notes that their views of formative evaluation as it relates to instructional-product development are less dependent upon an external evaluator, primarily because they emphasize the necessity of structuring evaluation so that it "serves" decision-making purposes by producing appropriate and timely information. Thus, the possibility exists in these models that the evaluator can be a part of the development team, if that arrangement seems most efficacious for providing the kinds of information that are required for the decisions that must be made. Alkin (1973) has expressed his concern for evaluation being integrally tied to the specific design-purpose by arguing for the necessity of the evaluation role being "framed by the decision context."

The total evaluation model developed by Provus (1971) offers another set of guidelines for the formative evaluation of instructional products. Provus' total-evaluation model was designed from the vantage point of the development of instructional programs and materials within an individual school district. Thus, while it also is not focused specifically upon evaluation related to instructional product development, the model has considerable relevance and offers insight into the appropriate procedures for the formative evaluation of instructional products.

What must be concluded from this examination is that while the term "formative evaluation" was invented by Scriven and pressed to the collective bosom of the evaluation community, these conceptions of evaluation have for the most part been addressed to the evaluation of total educational programs with specific context designations, rather than the evaluation of instructional products being devised by developers. In fact, even before the entrance of the evaluation community into the field of formative evaluation, there existed an evaluation process integrally tied to and a part of instructional product development, particularly as it related to programmed learning, even though it had not been so elegantly named and identified.

Instructional Product Development Technology

Now let us consider the formative evaluation models and procedures that grew from the instructional product-development movement. Instructional product-development as a technology emerged from the programmed instruction and the curriculum development movements of the late nineteen-fifties and early nineteen-sixties. By the beginning of the nineteen-seventies, the field had achieved a dramatic growth-rate. One evidence of the growth of the field during the past decade is demonstrated by the evolution of over 20 regional laboratories and R&D centers, many of which have been leaders in the development of formatively-evaluated instructional products. Furthermore, there have recently been many publications in the literature describing various schemes and models of product-development processes (Baker, 1973; Banathy, 1968, Borg and Hood, 1968; Briggs, 1970; Glaser, 1966; Mager and Beach, 1967; Stowe, 1969; Schutz, 1970; Sullivan, 1971; Locatis and Smith, 1972; Johnson, 1972).

The complexity of the educational product-development models varies considerably, from conceptual schemes (Schutz, 1970) to comprehensive, step-by-step procedural checklists (e.g., Borg and Hood, 1968). But, at the core of each model, regardless of its complexity or simplicity, regardless of its esotericism or practicality, is the realization that product development and formative evaluation are intertwined as snake and staff and that product revision depends upon the generation of formative-evalution data.

Numerous examples can be cited of specific applications of product development-based evaluation models. For instance, in a description of the procedures used in improving Project PLAN materials, Rahmlow (1969) describes the use of field data from 13 school districts. While this was not a research study, it is presented in this section in order to "balance" the discussion on data sources, and to provide the reader with a description of the categories of data commonly used in large-group formative evaluation. The system reported that Rahmlow (1969) relied on the following types of "hard" and "soft" data:

Hard data included the following categories:

1. item statistics of module tests indicating the number of students selecting each option
2. frequency distribution of student scores on module tests on an objective-by-objective basis
3. frequency distribution of student scores on module tests on objective-by-objective by Teaching-Learning UNIT (T.L.U.) basis
4. cross-validation data on parallel items administered at various time intervals

Soft data included observational and teacher-observed behavior:

1. questions asked of the teacher about T.L.U. used in conjunction with item analysis provide clues for improvement. questions cover overall evaluation of T.L.U., learning activities, and tests
2. student responses to questions (concerning amount of time, assistance, attitudes, etc.) are also used in conjunction with hard data
3. project personnel working on improvement make periodic visits to Project PLAN Schools to maintain a realistic context for data interpretation

Centers and Laboratories have also produced many documents illustrating formative-evaluation processes. (See Lindvall and Cox, 1970; Light and Reynolds, 1972; King, 1970; Nimnicht, 1970; Niedermeyer and Ellis, 1970; and Miller, 1972.) There are examples that might be provided of applications of formative-evaluation procedures to product development. A search of the ERIC system reveals the following listing: Grobman, 1968; Bogatz and Kurfman, 1966; Branson, 1971; and Raynor, 1972.

There is no question but that formative-evaluation procedures have been most thoroughly refined and implemented at the regional laboratories and R&D centers involved in developing instructional products. There is also substantial evidence of this use by other agencies or individuals engaged in the development of instructional products. Some have argued, however, that the specificity of the formative-evaluation procedures which to a large extent were developed at these laboratories and centers have provided only "techniques applicable to simple stimulus configurations such as textual programmed instruction" (Abedor, 1972). Abedor suggests that try-out and revision procedures appropriate for programmed instructional materials are not appropriate for multimedia systems. We would question that suggestion and point out that many of the formative-evaluation procedures employed at these laboratories and centers indeed have been applied to multimedia systems (Lindvall and Cox, 1970; Hood and Johnson, 1969).

We maintain that the evidence is clear that well-applied formative-evaluation procedures are equally appropriate for instructional products of all types. Indeed, the formative-evaluation procedure proposed by Sedlik (1971) for evaluating instructional films and television productions is not significantly different from other formative-evaluation models. Diagnostic pretesting using a "feedback-oriented evaluation context by applying systems techniques" (Sedlik, 1971) is the essence of all formative-evaluation procedures.

Other formative-evaluation procedures have been developed which are related specifically to mediated instruction, in particular, films. (See Finn, 1956; Kaufman, 1964.) Even though the overwhelming number of films have not been subjected to formative try-out, there are numerous examples of individual applications of the use of formative-evaluation procedures in the development of mediated instruction (see Sedlik, 1971).

In the next section of this chapter we will describe in detail the steps involved in performing a formative evaluation of an instructional product.

PROCEDURES FOR FORMATIVE EVALUATION

Descriptions or recommendations of procedures for conducting the formative evaluation of instructional products must always be muted in their prescriptiveness. Clearly, different projects will require different distributions of attention, and, certainly, there is no "right" way to conduct an evaluation. On the other hand, there may be some wrong ways. A well-meaning evaluator might be able to improve her or his contribution by the use of procedures which have been tried successfully by others. The purpose of this section is to identify some critical elements in the conduct of formative evaluation of instructional products during development. The procedures described here should be viewed as points of departure. More importantly, a set of guiding questions will be described which should assist the evaluator in determining whether the implementation of formative assessment has been circumspect, complete and economical.

Data and Decision-Making

"Data-for-decision-making" is the basis for much formative evaluation; perhaps, in fact, it is the slogan of the activity. However, the proper implementation of this concept is not necessarily obvious. In order to gather data to assist in decision-making, the evaluator must have a good idea of what the possible decisions may be at any stage of development. With such knowledge, the evaluator is able to procure data that apply to these decisions. Therefore, data for decision-making may imply not only that an overall assessment of a program is required, but that every type of data collected will contribute to the decision-making process itself. If one pursues the implication that all data collected should be reflected in decision processes, one is faced with an immediate concern; the range of possible decisions should be articulated in advance of the plan for data collection.

A more typical procedure may involve the development of an innovation and its subsequent trial, to see if it "flies," "waves," or perhaps "bombs," in the metaphor of the vernacular. The evaluator may be doing a through assessment of the program effects, yet in a formative context, the evaluator must also collect data which will permit the expedient revision of the program so that improvement in results can be anticipated in future trials. Thus, the sorts of information tapped and analyzed must be of such a nature as to assist in the revision process.

Suppose, for simplicity's sake, one were involved in the development of a program that had a single objective. Many evaluators would collect data on post-instructional performance with respect to that objective, provide the achievement level to the development staff, and thereby conclude her or his effort. Such data are likely to be sufficient when the program is successful. More finely-grained information would not be necessary, for program in which revisions are not required. But most projects do not develop successful innovations on the first trial. To be of service, the formative evaluator must understand the range of options that the project has available as s/he anticipates the worst possible outcome from evaluation; what should be done if significant components of the program fail? The kind of answer one gives to this question is clearly a function of the stage of development of the program at the time of data collection.

Two distinct development stages have been identified by writers in the field (Markle, 1966; Schutz, 1970). The first stage can be termed the initial development stage, a phase of activity that culminates in a prototype instructional sequence for testing. The second phase of development occurs following the successful test of the prototype, when additional components and procedures are added in an attempt to make the program useful in a real setting. Each of these development stages has an associated set of formative-evaluation activities.

The purpose of evaluation during the prototype stage is to verify whether the instructional product is capable of producing the desired outcomes. Data collected to assist in this judgment must anticipate the possible range of decision in the prototype-development phase. Data gathered at the operational stage of development should pertain not only to the level of learning achieved by the students, but also to the degree to which the program functions as anticipated and to which it receives approval by administrators and teachers. There would seem to be a close relationship between the degree to which the program is likely to be an instructional success (that is, meets its objectives) and the practicality-of-use dimension.

There are three general areas of concern in formative evaluation of instructional development. The question of instructional design should be paramount during the earlier phases of instructional development, the prototype stage. The evaluator turns her or his interest to an additional set of concerns during the operational development stage, in attempts to determine the usability of the program in the range of intended settings. A third element for the attention of the evaluator is the process and organization of the development institution itself. This question is of particular concern for agencies with a lengthy anticipated life-span. Each of the areas--instruction, operations, and development processes--will be briefly explored in light of the data it is desirable to collect at each stage.

Initial Development: Instructional Sequence

The desired outcome of the initial development effort is the production of a prototype or prototypes which can be tested to determine their power in assisting the learner to meet program goals. In the initial development cycle, the designer makes her or his best attempt to generate an effective sequence. Presumably, careful analysis enters into the choices of the instructional **principles** for use, the instructional **approaches** selected, and the adequacy of the content in terms of comprehensiveness, importance, and accuracy. An assumption made here is that some sort of review of goals and tryout of measures have preceded the instructional design phase, but clearly, formative evaluators must verify this presupposition.

What sort of data would assist in the potential revision of the instructional prototype? Two major classes of formative-evaluation information are necessary: (1) Information about the effects of the program, and (2) information that should assist in the remedy of program deficiencies.

Under category one the primary question at the prototype phase relates to the success of the program in meeting its goals. The relevant data source for this question is the student performance on the criterion set of tasks. Clearly pretest data will be necessary to determine the magnitude of improvement evidenced by the students. A second concern in terms of program effects could be the reaction of the learner to the objectives, instructional sequence, and approach of the instruction, particularly for these programs in which learner affect toward the program is critical. Notice that questions regarding the learners' interest in the format selected or media used is not critical at this phase of development, for prototype tests often employ rough-cut versions of film, storyboards rather than fully developed renditions, or ditto-mediated rather than three-color, type-set, versions of text. A third area of concern, even at the prototype-development phase might be producing. The conduct of free-discussion interviews with subjects may help to uncover types of misinformation that the product is unwittingly generating. In summary, the three types of data important to determining product effectiveness in the prototype or initial development stage are: (1) Student performance of post-instructional tasks, (2) Student attitudes and satisfaction with program, and (3) Unanticipated side effects engendered by the program.

The second category of data in the initial development tryout relates to providing diagnostic information to the developer in order that the product may be altered if necessary. Without such a data source, each modification will represent merely another unsubstantiated hypothesis, and the probability of success will not increase with each formative trial. Each revision would be, rather, an independent event, with the probability that the revision will improve the situation unchanging from revision to revision. Such a situation would clearly not be desirable in development settings where schedules of completion and funding are often contingent upon the demonstration of program success in a planned period of time.

Data sources to assist in the revision of initial tryouts must be pertinent to the types of modifications that the developer may make. The following data issues are presented for consideration.

Expert Judgment

Expert judgment regarding instructional products probably should be secured when the specifications of the product are being developed. Experts can respond to the selection of goals and content as well as to the adequacy of measures. However, one might also wish to subject prototypes to the scrutiny of content specialists who, for instance, might detect subtle errors in subject-matter or sequence.

Program-Response Data

What is the pattern of errors that the learner makes on practice exercises in the instructional program? What other sorts of records of student behavior can cue the developer to the particular sections of the program that are not assisting learning? Data may be assembled from the actual responses the student makes in the process of instruction.

Program-Critique Data

How helpful does the learner find particular examples which have been provided in the instruction. Is the organization of the materials suitable? Is the level of language appropriate? Are there sections that provide particular difficulty or confusion? Does the approach make sense to the learner? Data for use in answering these questions, all of a diagnostic nature, may be obtained in at least three ways. First, learners may be instructed to cricle difficult words, write comments, or place question marks in the materials that they are exposed to. If printed materials are not utilized, then periodic, brief formative checks might be made at regular intervals, in which the learner is asked to provide answers to questions similar to those listed above. Or single learners may be queried as they proceed through the program. A third source is a post-instructional diagnostic questionnaire, which asks students to give their analyses of and suggestions for the revision of the sequence. An interview can also provide informatin that should enable the developer to identify particular aspects requiring revision.

Procedural Considerations in Data Collection

It should be clear that the initial development tryout represents a case in which the formative evaluator wants very detailed, very specific information. The formative evaluator must plan to gather all of the data which possibly might be useful in making the revision at this point, particularly due to her or his low level of confidence that the program will succeed. The developers' design has been a carefully executed hypothesis, but no one has reason to believe that it will be successful. Thus, the formative evaluator should consider two points in the planning of the initial development evaluation: first, that relatively few students should be exposed to untested instruction; second, that students selected for the field trial should be expected to provide both post-instructional and performance data. The rich variety of data expected requires careful analyses, analyses that may often be resistent to easy summary. These two factors, exposure to untried instruction and the need for rich data, combine to suggest that the initial development tests be conducted upon a relatively small number of students and that the data collection procedure be designed to provide the completeness of data required. Smaller samples represent a loss in the reliability of the data and a shortening of turn-around time for analysis and revision. Since initial development often has an exploratory character, it would be unwise to interrupt the development process with lengthy intermissions caused by the analysis of too much data. Thus, the use of smaller samples, more intensively analyzed, would appear to be appropriate at this stage of development.

Operational Development: Practicality

Following the occurrence of a successful initial development try-out, an event which is likely to require more than one cycle of development-trial, the development operation shifts focus to a concern with the usability of the program in the range of anticipated settings. The attention of the formative evaluator conducting a field trial must similarly be directed to issues of practicality, providing, of course, that the program still produces the desired student performances. Recalling the classes of data identified in the initial development tryout, we find that (1) the effects of the program should be assessed; and (2) diagnostic information should be obtained which might assist in revision. Again, what are the questions of concern to the developer at this point in the project? First, of course, is the extent to which the program is succeeding with the learners. The same questions regarding program effects in terms of learner achievement which were identified in the initial tryout stage must be reconsidered:

1. Student performance on post-instructional tasks
2. Student attitudes and satisfaction with the program
3. Unanticipated effects engendered by the program

Such data are collected so as to ascertain whether or not the translation of the program into operational status has in some way reduced the effectiveness of the learning sequence.

There are several other questions which must be addressed at this stage that require diagnostic data. If a proper initial development try-out had been conducted, few questions should remain regarding the instructional sequence itself. The revision questions of interest will therefore revolve around the extent to which the user is satisfied with the materials, the administrative feasibility with which they can be used, and the students' responses to the integration of program components and the format chosen for instruction.

Within the category of data measuring program effects, additional information may be sought about the following concerns:

1. Student satisfaction regarding the format and the integration of the program components.
2. Administrator or instructor ability to implement the program.
3. Administrator or instructor satisfaction with the program.

Student satisfaction can easily be tapped on a questionnaire, administered at the conclusion of the program. Administrator ability to implement the program can be assessed in more than one way. Observers may record teacher behavior involving critical components of the program. Teachers themselves may prepare reports on their daily successes and failures in using the materials. Query-telephone lines might be made available, so that administrators can call and ask pressing questions about program use. A record of the sorts of questions asked may be useful. Teachers' satisfaction with the program may be assessed through both questionnaire and interview procedures.

As has been noted, the second major class of data in an operational field-test relates to the provision of diagnostic information necessary for program revision. Since the emphasis in a field test is different from the emphasis in the initial development test, the potential kinds of revision activity differ as well. Rather than concern with learning principles, adequacy of examples, and viability of the approach, revision will more likely be concerned with clarifying and simplifying directions to students and teachers, so that the program can work within the limitations imposed by the instructional and administrative settings. Questions regarding the integration of materials, such as whether or not materials were actually employed in the sequence anticipated, should be answered. Information regarding the feasibility of the selected presentation media should be gathered (for instance, if hardware was required, were there frequent technical problems, e.g., television monitors that were fuzzy, projectors that didn't operate?). Rather than research-oriented learning principles, the developer will utilize knowledge about management in solving whatever problems that the field trial uncovers.

The field trial has another important function, in that it serves to identify (or to refine) the teacher/user training requirements to which the program should attend. If teachers are systematically misusing given components and if the developers wish to stay with their original design because of extremely positive prototype data, then they must add a teacher-training sequence to assure that intended procedures will be followed.

Clearly because several users are required, the number of students used in an operational field-test is larger than in prototype tests. However, note that the difficult data, observation, interview, and daily records, ae generated by the teacher or program administrator rather than by the student. Again, there should be concern to avoid an over-accumulation of data. Student data, where large numbers of students are utilized, should consist of relatively easily-quantifiable information. Any more-intensive scrutiny should probably be handled on a sampling basis, stratifying, of course, by teacher.

Evaluation of Process: Staff Procedures

Formative evaluation necessarily attends to the outputs of a given project (how well the progam works, what probably needs changing), but that is not all that it attends to. The formative evaluator may also be concerend with the evaluation of the development process--how the development staff is proceeding with its business. If a formative evaluator determines that a consistent problem occurs in the program, for instance, that the texts contain many typographical errors, then s/he may suggest that certain development activities be modified in order to avoid the recurrence of the problem. Formative evaluation can identify problems in communication, for instance, in cases in which there are apparently overlapping chains of authority that confuse staff. Formative evaluation may also identify redundancies in or areas of omission from the developmental process.

The impetus for the evaluation of staff processes derives from organizational research, and subsequent recommendations for revision activities will generally be based upon knowledge of social interactions and behavioral science, rather than of learning psychology.

Certainly, no formative evaluation of an organizational process in an agency should be conducted unless that agency will be functioning for some time. A short-term project may need to have certain glaring errors identified but the careful analysis of interaction patterns would probably not be useful. By the time the analysis was implemented, the project may have been completed.

SUMMARY

In this chapter we have tried to describe the research pertinent to the activity of formative evaluation. While the number of good examples of formative evaluation is expanding, research into the process is relatively limited. Perhaps a compromise to the difficult task of accumulating research data on formative evaluation might be suggested. When formative evaluation activities have been successful in terms of program effects and staff satisfaction, then detailed technical reports might be made available to the evaluation public. Formative evaluation might improve as a consequence of the technology developed in the course of finding solutions to development data problems. Both the increase in technology as a result of dissemination of successful procedures and the pursuit of experimental research on the process of evaluation might ultimately remove formative evaluation recommendations from the realm of seers and clairvoyants and bring it near, if not into, the domain of scientific application.

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Chapter 26

Naturalistic Inquiry: An Alternative Methodology for Instructional Development Research

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For ID to become a vital force, much more knowledge must be accumulated. Much of this knowledge can be gained from a study of what we do as we carry out our development functions on a daily basis. A study of our activities, while working with clients and other colleagues, must be conducted through unobtrusive means. But most of the Research Methods courses we had in college were highly biased toward the use of obtrusive methods. Where can we find unobtrusive methodologies? Naturalistic Inquiry: An Alternative Methodology for Instructional Development Research addresses this question.

When confronted with perplexing problems, most instructional developers take some comfort in the results of future instructional and educational research. Calls for research into the many difficulties associated with the practice of instructional development are commonplace and leave the impression that answers, if not imminent, are "on the way." Many ID practitioners, faced with heavy service commitments, have withdrawn from research activities, leaving such matters to those who teach instructional development or educational psychology in the universities. These practitioners reason that eventually the research performed by these academicians will result in answers to difficult questions surrounding the psychology of learning, the prescription of precise instructional treatments, and the ID consulting process. Yet most of us would have to admit that the usefulness of most instructional and educational research has been disappointing. It is disheartening, especially when one considers the dollars and energy which have expended, how little of what we know is the result of systematic research. It is the thesis of this chapter that instructional developers and other educational researchers have embraced only a narrow range of classical research strategies; that these, taken alone, are often inappropriate for the questions at hand; and that naturalistic inquiry offers a methodology which may well prove appropriate.

THE IMPACT OF TRADITIONAL EXPERIMENTAL DESIGN UPON ID RESEARCH

Instructional development is an applied activity which seeks to influence human behavior. As such, it shares with the social sciences an unfortunate research heritage--classical experimental design. Like researchers everywhere, those in education have been taught in graduate school the hallowed components of experimental design--control of confounding variables either through constancy or randomization; well defined, quantified dependent variables; careful manipulation of independent variables; tests for statistical significance of the difference among dependent variable means. Somewhat relaxed versions--quasiexperimental designs allowing non-random assignment to treatments--have received acceptance, but are undertaken apologetically and while retaining as many characteristics of classical design as possible. The "objectivity" and "rigor" of the classical approach are lauded; none of its shortcomings and misapplications are typically noted. No alternative strategies are offered. Graduate students in education leave school prepared to conduct only one type of inquiry and lacking in respect for any other. A recent analysis of the methods used in research published in the American Educational Research Journal revealed the predominance of traditional ANOVA designs with multivariate designs lagging far behind in number, and qualitative methods all but nonexistant (Willson, 1980). Unfortunately, classical or modified-classical experimental design is not well suited to the exploration of complex, human phenomena such as instructional development and learning or to the role adopted by most instructional developers. To understand why, adopt the perspective of a classical experimentalist and look at the characteristics of the instructional developer's research interests and of the instructional developer's role.

The experimentalist views the world as composed of variables. Divide the instructional developer's world into variables and then examine the nature of these variables and the conditions surrounding them. One factor that will be noticed immediately is that the number of variables impinging upon an ID research question is very large. Whether the developer's interest is in explaining learning or in examining the instructional development process, a plethora of relevant variables will be present in the arena. Assume as a working example an interest in examining the relative effectiveness of alternative instructional strategies. Just a short list of variables impinging on this question includes: learner characteristics--general ability, maturation level, specific aptitudes, cognitive style, attitude, motivation, and pre-knowledge; context variables--physical environment (a conglomerate variable in itself), instructional characteristics (with as many components as listed above for learners), interaction with other learners, school or institutional factors; outcome variables (possible dependent variables)--achievement at various cognitive levels, changes in attitude, longevity of effects, utility of learning outcomes. And this list doesn't include all the salient independent variables--the ones which describe the alternative instructional strategies themselves.

Remember, as classical experimentalists we must control all confounding variables either by keeping them constant across treatments or by randomizing their influence so that the size of their impact upon results can be estimated statistically (Guba, 1978); hence, random assignment of subjects to treatments, random assignment of instructors to treatments, etc., is mandated. Furthermore, continuing the example of the ID research problem described above, the relevant characteristics of the alternative instructional strategies--the independent variables--must be known in advance; after all, those are the factors that we as researchers are going to manipulate. Likewise, all important outcome variables--the dependent variables--must be known in advance; otherwise, we wouldn't know what to measure for future submission to statistical tests. Such is the traditional experimentalist's view of an I.D. research problem.

In judging the applicability of this experimental approach to instructional development research, two questions arise. One, how many instructional developers can abide by the classical rules in conducting an inquiry, and two, how advisable is it to attempt to do so?

The answer to the first question should be apparent and not in need of extensive discussion. Most instructional developers inhabit the 'real world' of instruction where experimental manipulation is difficult. Our consultant role provides us with influence upon instruction and instructors but not with control--not with the kind of control that would allow us to prescribe who would be exposed to what treatment, when, and under precisely what circumstances. So the answer to question one is "approaching zero," and we are forced to a compromise on classical design immediately.

The answer to the second question--how advisable is it to attempt to adhere to the rules of classical experimental design?--is more difficult and requires at least a brief examination of the nature of our attempts to meet the experimental ideal as best we can. Given that we can't abide by the stringent experimental rules that physical scientists can, how much of our research methodology is still determined by our attempts to accommodate the tenets of classical design, and what are the consequences of our design compromises?

One concession that some educational researchers make to the demands of classical design is to move research out of the real-world classroom and into the lab. (Psychologists will go even one step further and use non-human subjects.) The appeal of this "lab concession" is, of course, the control it allows over the physical environment, over the assignment of subjects to treatments, and over the details of exposure to treatments. The cost of this concession is in terms of external validity; that is, the results of such research are difficult to generalize "across times, settings, and persons" (Cook & Campbell, 1976). In other words, it is questionable whether results obtained under artificial lab conditions hold true under real-world instructional circumstances. Not much more needs to be said about the external-validity problem here since extensive discussions of threats to external validity exist in the literature. Bracht and Glass (1968) and Pereboom (1971) provide clear summaries for the reader unfamiliar with this issue.

Most educational researchers are wise to the severe generalizability problems posed by instructional research conducted in labs or otherwise atypical environments. Therefore, some control over the experimental environment is sacrificed and quasi-experiments are conducted. Campbell and Stanley (1963) describe quasi-experiments as follows:

> There are many natural social settings in which the research person can introduce something like experimental design into his scheduling of data collection procedures (e.g., the when and to whom of measurement), even though he lacks the full control over the scheduling of experimental stimuli (the when and to whom of exposure and the ability to randomize exposures) which makes a true experiment possible. Collectively, such situations can be regarded as quasi-experimental designs.

In other words, quasi-experiments involve assessments conducted in intact classrooms or other naturally occurring situations where many of the variables cannot be controlled or manipulated by the experimenter. To the extent that the natural classrooms included in quasi-experiments are representative of classrooms to which the results of the research are generalized, the external validity of educational research--so jeopardized by laboratory experiments--is increased by the use of quasi-experiments. However, quasi-experiments have their own particular shortcomings; because so many variables in a natural setting cannot be controlled, the internal validity of experimental results is threatened. Internal validity has to do with the validity of cause-and-effect inferences within the experiment. Internal validity is high to the extent that one can be sure that the experimental outcomes are due to the effects of the independent variables rather than to other environmental variables or characteristics of the particular subjects involved. With so many variables uncontrolled in natural settings, however, quasi-experiments open a wide avenue to misinterpretation of the true causes of outcomes. According to Cook and Campbell (1976), "Instead of relying on radomization to rule out most internal validity threats, the (quasi-experimental) investigator has to make (all of the threats) explicit and then rule them out one by one. Therefore, internal validity is increased to the extent that the investigator is aware of all plausible, alternative explanations of his data besides the casual relationship he has hypothesized."

In the search for such alternative explanations, however, our classical experimental design tradition and training are a handicap. Because we are taught to specify all important independent and dependent variables in advance, as well as to state specific, a priori hypotheses regarding these variables. Most educational researchers are not likely to conduct their research in a way which will allow them to detect alternative explanations and unanticipated outcomes. Most researchers still conduct their investigations from a relative distance, selecting their outcome measures--quantifiable variables only--and the presumed relevant independent variables and covariates well in advance and focusing their attention upon these variables throughout the investigation. For example, many researchers are present in the classrooms under investigation only when the experimental measurements are being taken, precluding the observation of possibly-important attendant variables, outcomes, and explanations of results.

The foregoing section might be summarized as follows. Instructional development researchers have inherited an ideal of experimental design which when used exclusively is inappropriate for their research needs because (a) ID research involves a multitude of variables, many of which are difficult to quantify; (b) the variables in which instructional developers are interested cannot be meaningful isolated from a 'real world' context; (c) the role of most instructional developers does not allow them to control many of the critical variables operating in "real world" instruction. Persistence in attempting to retain the characteristics of this traditional experimental model leads to (a) research in distorted environments yielding results of questionable external validity and (b) research in natural environments without methodological safeguards of internal validity.

AN ALTERNATIVE--NATURALISTIC INQUIRY

The problems with traditional experimental design as described in the previous section are not unique to researchers in instructional development and education. Other disciplines that seek to explain and predict complex, human phenomena which cannot be legitimately "broken up...into a temporal chain of events all connected by determinate 'casual' relations" (Rapoport & Horvath, 1968), have faced similar difficulties. Researchers in the fields of anthropology, sociology, psychology, and evaluation have developed and refined a research perspective and accompanying methodology that has great promise for instructional development research--naturalistic inquiry.

Characterizing the naturalistic investigator (NI), Guba (1978) wrote:

> He is concerned with description and understanding; thus he begins as might an anthropologist learning about a strange culture, by immersing himself in it, with as open a mind as possible, and permitting impressions to emerge. As impressions are formed he checks them out by various means, e.g., "triangulation," testing one source against another until he is satisfied that his interpretation is valid...The naturalist might claim his model to be investigative journalism, in which "truth" can be elicited from partial and even

> reluctant sources by processes of cross-checking, triangulation, and recycling until convergence is achieved.

It may be useful here to list separately and discuss briefly the characteristics of naturalistic inquiry which distinguish it from the well-known classical experimental approach.

Absence of Prior Assumptions

Naturalistic inquiry is characterized by a relative absence of a priori hypotheses and decisions regarding the importance of variables and outcomes. Rather, the investigator enters the study with only tentative notions about what might be important, forces himself to be open to all aspects of the phenomena before him, and then allows the relevant outcomes and most-powerfully explanatory variables to emerge as the study progresses. Another way of viewing this approach to inquiry is as Brunswick (1956) called it, "a successive omission" as opposed to "a successive accumulation" of factors. The investigator in a naturalistic study deals initially with an undisturbed phenomenon having as the goal of his inquiry the elimination of irrelevant factors and, ultimately, a parsimonious explanation of causes and effects. An experimentalist, on the other hand, will seek to explain a complex phenomenon by selecting a relatively few variables in advance and testing a hypothetical relationship among them, believing that an accumulation of such tests will eventually lead to a confirmed explanation of the total undisturbed phenomenon.

Theoretical Sampling

This term has been given by Glaser and Strauss (1967) to the process of data collection used by NIs (Naturalistic Investigators). The process is one "whereby the analyst jointly collects, codes, and analyzes his data and decides what data to collect next and where to find them, in order to develop his theory as it emerges" (Glaser & Strauss, 1967). In other words, unlike the experimentalist, the naturalistic investigator cannot decide in advance every piece of data that ought to be collected and by what methods. This condition is necessitated by the relative absence of a priori assumptions and hypotheses essential to naturalistic investigations.

Comparative Analysis of Groups

Naturalistic inquiry is characterized by the careful comparison of naturally-existing human groups selected to vary in degrees of similarity. Unlike the research to which we have become accustomed, wherein subjects are selected from some available, sketchily-described population meeting general requirements, naturalistic research entails the close examination of intact groups carefully chosen to shed light on the problem under study. If the inquiry is directed toward hypothesis or theory generation, these comparisons help define the variables or theoretical elements and their relationships. Here the investigator is seeking to determine whether a characteristic observed in one group is ideosyncratic, or, on the other hand, an explanatory variable which cuts across other groups. If the inquiry is verification-oriented, systematic comparison across groups strengthens the external validity of the conclusions. By comparison, traditional researchers are in a greater haste to publish results based upon experimentation with a single group drawn from a hazily-defined population.

"Real-World" Settings

As mentioned earlier, naturalistic investigators confront undisturbed behavior and environments for the purpose of generating analyzable data from them. The writings of Barker (1965) and Guba (1978) are useful here. Barker (1965) describes the traditional role of the experimenter as that of "operator", i.e., one who dominates the experimental situation by "regulating input, and/or influencing interior conditions, and/or constraining output" as well as serving as translator of the phenomena into data. Quoting Guba's (1978) examples:

> The (experimental) investigator decides both upon the nature of the independent variables and how they shall be manipulated (e.g., subjects' IQs shall be divided into three ranges for low, medium, and high intelligence), and upon the nature of permissible outputs (e.g., number of nonsense syllables that can be recalled immediately and ten minutes following memorization).

In contrast to these familiar roles, NIs manipulate neither independent nor dependent variables. Their interest is in analyzing and explaining naturally-occurring phenomena.

Multiple Data Sources

Naturalistic investigators seek out more sources of data bearing on their research problem than do traditional experimentalists. NIs are quite flexible in their definition of acceptable data and are willing to pursue any information which may shed light on their research problem. For example, whereas a traditional experimentalist will decide well in advance what his quantifiable, dependent variable measures are to be, a naturalistic investigator may use interview data, observation logs, documentation, records, and conversation as well as standardized instruments, tests, questionnaires, specific behavioral indicators, or other more readily-quantified data sources.

The inclusion of multiple data-sources in naturalistic inquiry arises from two sources. One is the "real-world" setting in which the investigation is conducted. The NI is interested in all the factors in the "real world" which bear upon the problem he is studying; a wide investigative net is required in order to allow all of those factors to emerge. The second reason why multiple data-sources are a characteristic of naturalistic investigations has to do with the previously-mentioned safeguard of internal validity. The validity of the NI's explanation of events is strengthened by confirmation from a variety of sources. The term for this technique of confirming validity through the cross-checking of several sources is "triangulation." Drawing an insightful parallel with traditional research, Guba (1978) says of triangulation, "As statistical means are more stable than single scores, so triangulated conclusions are more stable than any of the vantage points from which they were triangulated."

Observation and Description

Because of its focus upon complex phenomena, much of the data relevant to a naturalistic inquiry can only be had through observation; the test scores and psychometrically-polished attitude assessments so essential to traditional inquiry are not rich enough in subtle detail to serve as the major data source of a naturalistic investigation. As Cronbach (1975) has noted, "There are more things in heaven and earth than are dreamt of in our hypotheses, and our observations should be open to them." These comments should not be taken to mean that NIs would not be interested in test-score data relevant to the area of their study. As the previous section on multiple data-sources explains, NIs are interested in any source of information which may shed light on the research problem. Even a constricted data source can be helpful in combination with information from other sources. The difference here between NIs and traditionalists is that NIs would not be content with the reduction of a complex phenomenon to a single quantitative measure--a frequent practice among experimentalists. Hence the value placed by NIs on detailed observation logs and thorough descriptions of events and their participants.

Value Accorded Subjects' Impressions

In contrast with traditional experimentalists, NIs are usually interested in the opinions of subjects regarding the phenomenon under investigation. Traditionalists are inclined to regard such self-reported data as unreliable or "soft," and this attitude has a decided impact upon the nature of their research. In Snow's (1974) words, "Unfortunately, the traditional emphasis on systematic factorial design has, perhaps unwittingly, fostered concentration on the boundaries of an experiment to the neglect of events occurring within the cells between pretest and posttest." In other words, the disdain of "soft" data has encouraged the reduction of phenomena to those few assessments which can "reliably" be made. The NI, on the other hand, tends to see subjects' self-reported impressions as one more source of information to be triangulated against other sources. The more sources consulted, the more confidence he can place in his explanation.

Value Accorded Deviant Cases

NIs are keenly interested in "deviant cases," i.e., those instances of a phenomenon that do not "fit" their proposed explanation. The reason is that these cases help the investigator to refine his explanations and/or to determine the extent of their generalizatility. Contrast this with the typical experimental design wherein the mean is the foundation; many cases are aggregated, mitigating the influence of deviance and making the examination of any individual case unlikely.

THE APPLICABILITY OF NATURALISTIC INQUIRY TO ID RESEARCH

As previously stated, there are several characteristics of instructional development and of instructional developers which suggest the usefulness of naturalistic inquiry as a research strategy.

Problem Solving in the "Real World"

Instructional development is an applied activity. Most professionals in the field operate in the "real world"; their schedules leave them little time for work on problems independent of their applied activities. This situation leaves most developers with few opportunities to conduct controlled experimental research. However, it does provide them with a valuable asset in conducting naturalistic inquiry--access to "real-world" classrooms. Gaining access to natural situations is a sizable problem for NIs in other fields. In this regard, practicing developers enjoy an advantage in educational research that even many professors of instructional technology do not have, i.e., access to intact classes or other learning situations usually varying in content, instructional strategy, instructor, etc. Thus access to "real-world" settings and the comparative analysis of groups, so important in naturalistic inquiry, are facilitated by the nature of the instructional developer's work.

Long-Term Involvement in Natural Learning Situations

Not only do instructional developers typically have access to intact classooms, their involvement with a given instructional problem is frequently of long duration. Unlike naturalistic investigators in anthropology or sociology, studying phenomena which they can visit only periodically, developers have the advantage of prolonged contact with learning situations. This characteristic of their work facilitates the in-depth involvement and comparative analysis of successive groups which foster sound naturalistic inquiry.

Systemic Predisposition

Most developers are philosophically biased to view events as multiply determined. They are accustomed to examining many variables which impinge upon a learning situation. Their initial perspective on a problem tends to be broad, and most have been sensitized to the importance of attending to unanticipated outcomes. These perspectives--an outgrowth of the solving of complex, 'real-world', problems--are invaluable in the conduct of a naturalistic investigation. As previously mentioned, many graduates of advanced-degree programs in education other than in ID do not have the orientation--or the skills--to engage in naturalistic studies.

Interpersonal and Analytical Skills

In addition to the systemic orientation described above, instructional developers also typically have a number of uncommon skills essential to successful naturalistic inquiry. Just a few of the fundamental skills required are described by Wolf and Tymitz (1977):

> Some of the more basic skills include listening, question asking, flexibility, coping with ambiguity and resiliency. Other skills more difficult to describe involve the ability to think spontaneously, to analyze and synthesize data **in situ** so as to eliminate or illuminate inferences, to avoid moral pigeonholing, to understand self-prejudices, to take useful field notes and accurately summarize information, to learn the value of comprehensive and frequent debriefing sessions, to become facile in conversing with people, and to learn how to move through natural settings with ease.

These skills might be loosely categorized as interpersonal skills and analytical skills. Most successful instructional developers have learned to interact well with others under difficult circumstances. The delicate interpersonal processes--such as contract negotiation and client evaluation--demanded by ID are excellent preparation for a naturalistic investigator who must remain non-threatening and unobtrusive. Listening and asking questions are two of the developer's most powerful tools. Just as important are the analytical skills most developers have acquired. They are typically adept at entering an on-going situation and quickly making sense of it. Their abilities to work with subject-matter experts from a diversity of fields suggest skill in sorting rapidly the essential from the peripheral. At their best, instructional developers are empathic and open, yet objective and thoroughly analytical. It is precisely this rare combination of qualities that is essential in a naturalistic investigator.

IMPLICATIONS OF NATURALISTIC INQUIRY FOR RESEARCH IN INSTRUCTIONAL DEVELOPMENT

The foregoing discussion of naturalistic inquiry suggests that some changes might profitably be made in the conduct of instructional development research. Some of these implications are listed and explored below.

Widen Methodological Horizons

Instructional developers and educational researchers in general need to be familiar with a wider range of research strategies than is currently the case. Knowledge only of experimental procedures restricts in several ways the questions an investigator is likely to ask. Because an experimentalist requires well-defined a priori variables, he will very likely seek further exploration of variables already defined in the literature rather than confronting a situation anew and allowing alternative variables and explanations to emerge. The exclusion of questions involving variables which are difficult to quantify has already been noted. The premature reduction of natural situations to a few manipulated variables and constrained outcomes is encouraged by our discipline's fixation upon experimental research techniques.

A knowledge of naturalistic methods, however, gives us a critical perspective from which to view educational research. Even traditional research designs can be modified to reflect naturalistic concerns. If a researcher approaches his problem with a naturalistic perspective, he is sensitized to the complexity of the 'real world' which all educational research ultimately seeks to explain. Consequently, a whole range of qualitative research methods whose unique benefits are seldom realized in educational research is legitimized. Interest in unanticipated outcomes is increased. Values ascribed to variables take on greater subtlety. The merit of multivariate studies with their greater capacity to handle complexity becomes apparent. Greater familiarity with naturalistic inquiry and its rationale among educationists generally would encourage a more critical consumption of research findings and consequently push educational research toward greater sophistication, i.e., methodological eclecticism.

Expand the Research Training of Graduate Students

One of the most effective ways to broaden the research perspective of our field in the long run is to modify the training of our graduate students. Most instructional developers need only to reflect upon their own graduate research courses to confirm their experimental focus. Instead of being a geniune, comprehensive introduction to knowledge creation, the first research course is too often a survey course in experimental design. Basic statistics courses are required but superficially conceived; students are taught to plug numbers into formulas rather than to exercise judgment in the appropriate use of statistics to answer research questions. Without a larger context within which to place this information, students are left with the impression that experimental design and statistical analysis are synonymous with research.

This is certainly not to suggest that experimental design and statistics be eliminated from graduate training. What appears to be advisable is the placing of these research strategies within a more comprehensive program which includes qualitative methods and naturalistic perspectives as well. Only when students are comfortable with the full range of research strategies available to scholars will they be able to choose those which are most appropriate to their research problem.

Be More Demanding of the Research Community

As consumers of research findings, instructional developers should advocate higher quality in educational research. We should object to the publishing of simplistic studies with 'stripped down' variables in the journals which we support. For example, when learning is the outcome of interest in a study, we should not accept low-level memorization tasks as an operationalization of learning. Our dissatisfaction should be communicated to journal editors; methodological issues should be raised when conference research presentations are screened and evaluated.

This role of advocate, however, is obviously predicated upon our own comprehensive knowledge of research methodologies. It would be unwise for developers to become advocates of any one methodology. In keeping with one of the distinguishing characteristics of our field, our position should be the advocacy of appropriateness in research strategy as in instructional strategy. As the previous two sections indicate, we also face the challenge of expanding our own research arsenal and communicating this broader perspective to our students.

Assume Research Responsibilities

As many of the previous sections of this chapter have suggested, practicing instructional developers should be conducting research in the field rather than relying entirely upon the efforts of educational psychologists and those who teach but do not practice instructional development. Naturalistic inquiry would seem to be an appropriate and feasible strategy for investigating some of our research questions. However, in order to become effective naturalistic researchers, developers must assume two responsibilities. The first is to educate themselves about the qualitative techniques involved. While most developers have some of the prerequisite skills and the opportunities to apply them, we must fully appreciate the rigorous requirements of naturalistic research. This chapter has been only a brief introduction to a complex and demanding research methodology which has an extensive literature of its own. Care must be taken that the naturalist's qualitative methods not be viewed as "research for those who hate statistics;" the integrity of the methodology must be safeguarded.

The second responsibility that developers who would be researchers must assume is that of familiarizing their colleagues in education with naturalistic methods. The reality is that most journal editors are biased in favor of classical experimental studies. Most editors are methodologically conservative and do not want to be accused of having published research that some critical readers might think is "subjective" or "soft." Advocates of naturalistic study will need to be articulate spokespersons for qualitative research when it is appropriate, and knowledgeable critics of traditional methods.

SUMMARY

The field of instructional development has a research problem, i.e., research does not seem to provide us with many answers. Though no one would be foolish enough to suggest that the problem is a simple one with a single solution, it has been the thesis of this chapter that a narrow knowledge of research methods among developers and educational researchers in general is part of the problem. The consequences of education's fixation on orthodox experimental methods are manifold. One of the most important is that learning situations tend not to be investigated in their complex, natural state. Another consequence is that practicing developers have withdrawn from active participation in research, relying upon academicians in their own and related fields. Naturalistic inquiry methods would seem to be both appropriate for many of our research questions and particularly well suited to the instructional developer's role. However, the successful integration of these unorthodox methods into the mainstream of educational research is predicated upon the developer's ability to employ the methodology with integrity and to articulate its appropriate place in relation to other research methods. Blind advocacy of any one method is as foolish in research design as in instructional design. Quoting J.A. Easley, Jr. (1973):

> One finds many different approaches to research and many different criteria for acceptable research within any well-developed science. The most important question for a research discipline, however, is how to find the most promising approach for research on a problem that is not being solved

satisfactorily by conventional techniques.

Instructional developers--perhaps more than any other group in education--should be able to make that point.

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B. STAFF RELATIONS

Chapter 27

The Instructional Developer and the Educational Media Production Staff: Relationships and Expectations

Lee J. Mullally

What is the appropriate role for a media production specialist to play in a project undergoing instructional development? Should materials produced as part of such a project be "slick," or can they be "quick and dirty"? What portion of a project budget should be devoted to production, and how should this portion be determined? The following chapter examines these questions from within the framework provided by a typical ID system.

Instructional development efforts often involve a team approach and should include specialists in learning theory, testing and evaluation, and media (Hoban, 1974). The educational media production staff is an important part of the instructional development team and is expected to perform many useful functions, especially if the production staff functions at a design level rather than at a mechanical level (Kemp, 1980). Producing media to meet specific objectives is more important then being able to merely perform those techniques involved in the preparation of the media. The relationship between the instructional developer and the educational media production staff is very important to ensure that the design process and the production process are integrated.

This chapter will explore the relationship between the instructional developer and the educational media production staff. In doing this it might be helpful to examine the steps in one systematic approach to the development of instruction, examining the roles adopted by the instructional developer and by the media production staff as they progress through the process. A six-step process (Mullally, 1977) will be used in describing the relationship between these two roles. These steps include pre-assessment, establishing goals, identifying and specifying objectives, designing strategies, selecting and/or producing resources, and evaluating performance. The role relationships to be described are not peculiar to this model of the ID process, however, and the following description could be applied to most other models with little modification. (See Figure 27-1)

PRE-ASSESSMENT

Analyze the Learner

The instructional developer is responsible for determining the characteristics of the individuals who are to learn from a specific instructional unit. If instructional development is a process designed to maximize learning, the learners must be analyzed in terms of entry-level skills and their knowledge in specific content areas, developmental abilities, socio-economic characteristics, attitudes and cognitive styles. It is very important to consider learner aptitudes and cognitive styles. It is very important to consider learner aptitudes when media decisions are to be made. Aptitudes will also influence the content treatment, especially if learners are at varying ends of the

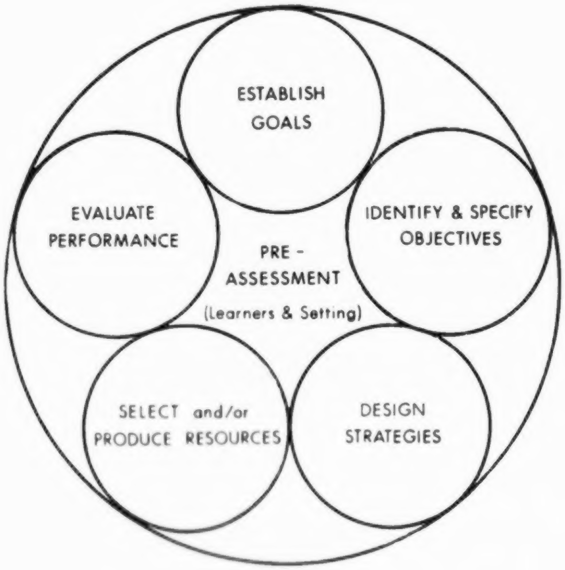

Figure 27-1. Preassessment.

developmental scale. Learners having different socio-economic backgrounds may require different referents and certainly will vary in their experiences with educational media, especially now that micro-computers can be found in many homes.

The attitudes that a learner possesses may require the inclusion of different strategies in order to motivate learning. The variation in cognitive styles among the students might require the use of different forms of educational media, instructional environments or evaluation procedures.

The instructional developer is responsible for obtaining or designing the instruments which will be used in determining these learner characteristics. These instruments should then be administered to the sample population which will experience the instructional prototype, and a complete description of each learner should be developed for future reference as the instructional unit develops.

The media production staff is expected to be able to produce various types of media for accommodating the differences which exist among the learners. Production specialists must realize that no one medium can be used for all learners with equal success. Although the media production staff is not directly involved in analyzing the learner, the staff will need to translate learner differences into production needs as the strategies are designed and the resources are selected.

Analyze the Setting

Consideration of the learning environment is very important when designing instruction, and both the instructional developer and the media production staff should be involved in analyzing the setting. Some learning settings are well-equipped instructional classrooms, containing an abundance of resources, while others are stark, four-walled rooms without any equipment. Other environments might involve a field or laboratory-type setting. Some settings promote media utilization while others may limit the type of media that can be used. For example, having a remote-control unit that allows the instructor to control projection or audio equipment from the front of the learning environment would promote the use of media.

Constraints other than those involving equipment must also be identified as one analyzes the setting; examples might include personnel, money, time or administrative policy. These constraints will also influence the design of instruction, and in turn the types of educational media which might be incorporated into this design. While the modification of the design in light of these influences is the prime task of the instructional developer, the production staff should be aware of them also; they will affect the production budget, time frame, types of materials and other options involving materials production.

ESTABLISHING GOALS

Establishing goals is mainly the responsibility of the instructional developer and the suprasystem in which the developer functions. A needs assessment can be conducted in order to identify the societal, institutional or training needs. The needs that have been identified through an analysis of societal or institutional influences are usually translated into goal statements or broad statements which reflect the general learning outcomes for a particular unit of instruction. The instructional developer is responsible for establishing goals that are consistent with an institution's needs.

The media production staff is not involved in establishing these goals; however, once the goals have been established, the media production staff should be aware of the goals for the particular unit of instruction with which they will be working. This awareness is essential if they are expected to produce materials for some specified end, or if they are expected to perform at the design level rather than at the mechanical level. If these goals are not shared with the production staff, its members will lack a global view of the instructional unit.

IDENTIFYING AND SPECIFYING OBJECTIVES

The instructional developer is primarily responsible for specifying the terminal objectives, deriving them from the goal statements which were established in the previous step. Each terminal objective can then be analyzed in terms of those specific tasks involved in its achievement. This analysis assists the instructional developer in specifying the enabling objectives for each of the terminal objectives. The enabling objectives, when developed in a hierarchical format, will later assist the developer in sequencing the instructional activities for the learner. It would prove valuable for a learning theory specialist to be a member of the ID team in order to assist in developing the objectives and the sequencing hierarchy.

Once the objectives are developed, the instructional developer can easily design measures for assessing their achievement, since those evaluative measures should mirror the behaviors, conditions and criteria specified within the objectives.

Although the instructional developer is primarily responsible for specifying the objectives, the media production specialist must be aware of the objectives in order to better select or produce the media to be used for achieving them.

The conditions specified within each objective might include the use of particular aids or devices which are to be used when the behavior is to be evaluated. Likewise, the learner might be utilizing media as they practice the behavior within the learning environment. The media production staff would be responsible for procuring those media which would be used to attain and/or measure the specific learning intents.

DESIGNING STRATEGIES

The types of instructional activities which the learner will experience in a particular unit of instruction will be determined by the instructional development team. The learning theory specialist and the media production specialist can provide valuable input during this function.

Modes of Instruction

The ID team must determine if the instruction will be in a large-group presentation mode, a small group-interaction mode, or in an independent-study mode.

Pre-assessment data will influence the ID team as they determine which mode(s) of instruction are appropriate. The decision as to which mode of instruction should be employed will be based upon many factors. First, the ID team should examine the data obtained as a result of analyzing the learner. Some cognitive styles are more compatable with an independent-study mode while other styles might be more suited to the large-group presentation mode or to the small-group interaction mode. The data obtained from analyzing the setting will also affect the mode of instruction to be employed. Each mode of instruction involves certain space, material, equipment, personnel, time, and monetary constraints. (Wilkinson, 1973)

The type of objective to be met will definitely influence the mode of instruction, because some objectives can best be attained by a learner working alone, while other objectives may require the teacher's influence or the influence of peers (Gerlach and Ely, 1980).

Instructional Techniques

The ID team must also decide which technique will be employed within the particular mode of instruction. Although many instructional techniques exist, the following will be discussed in order to illustrate the importance of carefully selecting each technique: lecture, discussion, demonstration, and audio visuals.

If learner characteristics indicate cognitive styles with a preference for listening to an authority and the objectives are pertinent to the lower levels of learning (e.g. knowledge or comprehension), the lecture technique might best be utilized. That technique could be employed in either the large-group presentation mode or the small-group interaction mode. If the lecture technique were identified as being viable, the instructional developer, the learning theorist and the content-area specialist would be the team members primarily responsible for developing this strategy.

If the learner characteristics indicate a preference for verbal interaction, and if the objectives were concerned with the higher levels of learning (e.g. application, analysis, synthesis, or evaluation), the discussion technique might be appropriate. Again the instructional developer, the learning theorist, and the content-area specialist should develop this strategy. If discussion stimuli are needed, the media production staff should be consulted.

Those students who learn from observing real objects or phenomena and whose cognitive styles contain highly developed kinesthetic elements would most likely benefit from participating in or observing demonstrations. Although this technique, again, would primarily be developed by the instructional developer, the learning theorist and the content-area specialist, the media production staff might be involved in developing some of the materials, especially if laboratory manuals or worksheets were needed.

Those students having a preference for visual and/or auditory stimuli, and for the written and/or spoken word, would most likely learn when experiencing the audiovisual technique. This technique could be utilized in all three of the modes of instruction and would tend to the many different characteristics that learners possess. The development of this technique would involve the media production staff, as well as the instructional developer, the learning theorist, and the content-area specialist.

Thus, the instructional strategy for a particular unit of study must be based upon pre-assessment data and the specific objectives, and must be evolved through the cooperative efforts of the instructional development team.

SELECTING AND PRODUCING RESOURCES

Many educational media selection schemes have been developed to assist one in selecting instructional resources. However, most of them are limited to the selection of equipment and material resources and ignore the selection of facilities, personnel, time, and financial resources. These factors must also be considered when designing the unit of instruction, since each may prove to be a constraint within the system. These educational media selection schemes also vary as to the basic determinant used in making the selection decision. Allen (1967) proposed a selection procedure which was based upon the type of objective that one was attempting to achieve. Kemp (1971) proposed that one identify the teaching/learning pattern that would be most appropriate for the objective, the category of learning experience (e.g., direct, sensory, vicarious, etc.), and the verb and content referent in the objective before selecting the educational media. DeNike and Strother (1976) suggest that the educational cognitive style of the learner is an important determinant for selecting educational media. The author suggests that educational media be selected according to all of these variables. The learning intents, the learner characteristics, and the instructional strategy to be employed are important factors to consider when selecting educational media.

If local production is required in the absence of commercially prepared educational media, the instructional developer will be required to analyze the availability of existing resources (e.g., personnel, money, time) and work closely with the educational media production staff in deciding what educational media might be produced.

In the past, educational media was, for the most part, intuitively designed. As a result, the educational media which was used in instruction was often inappropriate and ineffeicient, if not totally ineffective. Not only was the content selection and message design of the educational media less than optimum, but the cost of the media, in terms of both time and money, was often unrelated to the value it might contribute to the achievement of the instructional goals for the unit being designed.

Once the mode of instruction and the medium for the message have been selected, the message must be designed. Both the instructional developer and the education media production staff should be involved in the message design. It is particularly the duty of the instructional developer to ensure that the final message design is in accord with the research in this area.

Producing the message vehicle is primarily the task of the educational media production staff. However, the instructional developer should join the educational media production staff in determining the method of production that is most appropriate to use in terms of the time and cost of the message vehicle.

The instructional developer must have final authority over quality control. The instructional developer must be able to reject an unsatisfactory product. If the planning of the production has been adequate, the quality should be sufficient and the rejection of products would be minimal.

The establishment of the production schedule and budget, like the schedule and budget of the entire development project, must be the responsibility of the instructional developer. Educational media has been produced with a high degree of artistic quality and polish and may be "over-produced." It also has been produced to yield an "amateurish" quality. It is the responsibility of the instructional developer, working closely with the production team, to determine the degree of technical quality required for the produced educational media. The instructional developer will need to allocate resources for both design efforts (e.g., project management, objective development, production of evaluation materials and processes, etc.) and production efforts. Dunathan (1979 describes how these allocations may be made and this decision process is graphically depicted in Figure 27-2.

The general level of achievement for the terminal objectives must be determined. This is the design value of the project and will always be high since the learner is expected to achieve the objectives of the instructional unit.

Need is a measure of the degree of facilitation required by the students to meet the terminal objectives; in other words, it is a measure of the discrepancy between the existing situation and the situation specified in the design value. This need has two components: a "real" factor and a "perceived," or subjective, factor.

The real factor represents the degree of design sophistication which the unit of instruction must represent in order to adequately insure that the learners achieve the terminal objectives. It is determined, in part, by such factors as the motivational level of the students, their backgrounds and skill levels, and the cognitive complexity of the learning task.

The perceived factor represents how important it is for the students to meet the terminal objectives in the eyes of those who are not directly involved in developing or implementing the unit of instruction, but who otherwise do have an influence upon the developmental project. It also includes the perception these people have of the difficulty the students have in meeting the terminal objectives.

The overall need value used in determining the production value is a result of the interaction of these two factors. The instructional developer should differentially weight the two factors composing need when determining the production value. Greater emphasis should be placed upon real needs, as opposed to perceived needs, whenever conditions permit.

If the need for a particular unit of instruction is low, the production value will increase. How-

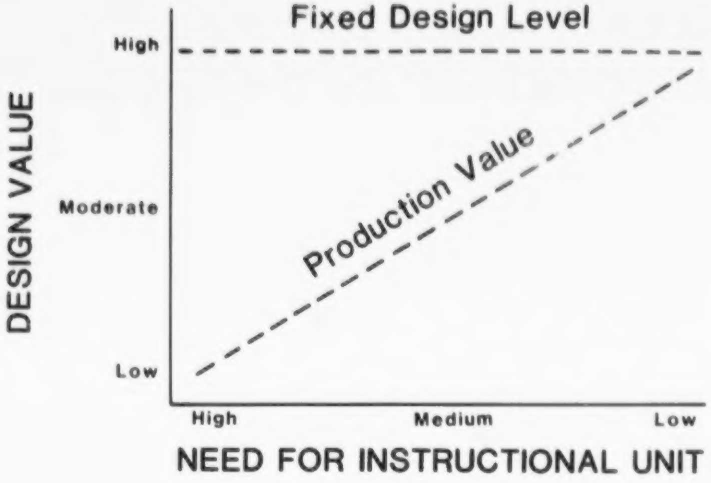

Figure 27-2. Resource allocation.

ever, if the need for a particular unit of instruction is high, the production value can safely decrease. For example, if a school system is attempting to teach communication skills to students so that the students will increase their performance on a state competency test the need to develop and teach these skills would be high and would not require extremely sophisticated or highly technical educational media. When developing the communication skills instructional unit, the instructional developer should allocate more resources for design functions and less for the production of educational media. A rational allocation of resources for the production of educational media is critical.

It is the responsibility of the instructional developer to determine both the design value of the instructional unit and the need for that unit. In addition to these factors, the instructional developer must consider the life-span and audience size when determining the appropriate production value for the educational media that is to be purchased or produced. The developer must have the final authority to reject the product because it exceeds the quality standards by too great a degree, and so exceeds the cost that the product can justify. The allocation of resources for producing educational media must rationally be accomplished, especially when funds are continually decreasing.

EVALUATING PERFORMANCE

The evaluation of student performance can only take place after the prototype, designed through the above steps, has been developed and tested. The evaluation specialist is the instructional development team member primarily concerned with this function. Tennyson (1978) suggests that instructional development should involve evaluation within each phase of the ID process. Although such an on-going evaluation program would be desirable, caution must be exhibited. If one were to conduct a separate evaluation of the material produced during the selection-and-production stage, more consideration would be given to the production value of the material than to its design value. Although it is important to evaluate the objectives as they are written and to evaluate the match between the objectives and those instructional strategies which have been designed for these objectives, the overall effectiveness of the instructional unit as a whole is far more important than the quality of any particular isolated stage within the ID process.

Based upon the results of analyzing the student performance, the instructional developer may need to work with the learning theorist to improve the specification of learning objectives or their hierarchical structuring, or he may find that revisions are needed in the design of the instructional strategies. The instructional developer and the educational media production staff may find it necessary to modify either the pre-existing resources selected for used in the unit or those which have been specifically designed for the unit, or both. The instructional designer might work with the evaluation specialist in order to improve the preassessment measures or those used to measure the specific instructional outcomes of the unit of instruction.

If student performance data is positive, the prototype unit can be implemented. However, if the data suggests problem areas, the necessary specialists, including the educational media production staff, must cooperate with the instructional developer in revising the instructional unit.

CONCLUSION

The instructional developer and the educational media production staff must cooperatively work together at various stages within the instructional development process. The outcome of the process is the creation of an instructional development process. The outcome of the process is the creation of an instructional system which will maximize learning. Various sub-systems are at work within that system, such as the system for the production of instructional products. However, the design value is crucial to the development of the system, and should not be overshadowed by the production value of those materials which are developed as a part of that system.

Although instructional development is considered to be a team approach, individuals often find themselves functioning simultaneously as the learning theorist, the evaluation specialist, and the educational media production staff. If this occurs, one must constantly step back and look at the process from a wholistic viewpoint. It would be very dangerous to look at the process from a product orientation, that is, as if one's final goal was the development of an educational media product, without examining some of the other stages beforehand.

Instructional developers can and should cooperatively work with the educational media production staff as well as with the other members of the ID team. Each team member can make valuable contributions to the ID process. But this can be done only if each member is familiar with the over-all process, with its final goal, and with the role each member is expected to play in reaching that goal.

Overall leadership for the team should be provided by the instructional developer, but this leadership should be of a facilitative, open, democratic kind which encourages each memeber to feel a personal stake in the success of the development project. If follows from this that, while the production effort is a subsystem within the development process, the production team is not subsidiary to the developer. Development decisions involving production should be made by the development team, including the production staff; they should not be made solely by the developer, though they should be made solely in terms of development principles.

Thus the developer must ensure, through her/his leadership, that the production team, as well as the other members of the development team, understand their roles within the development process. And s/he must encourage them to function in terms of achieving the terminal objective for the development project, not in terms of achieving a "hidden agenda," such as the production of materials having an exceedingly high production value.

Only as a last resort should the developer overrule the production team single-handedly. But, since production value must be subsidiary to design value, the power to do so must always reside with the development team, and ultimately with the instructional developer.

If the production staff members are aware of their roles, of the nature of the ID process, of the goals and objectives of the instructional unit, and of the constraints and pre-assessment data, and if the development team has proper leadership, a co-operative, maximally effective and efficient effort can be mounted; otherwise the ID-media production interface will be a constant source of problems.

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V. DIFFUSION

One of the most difficult roles of the instructional development community, or of any other community whose goal is to improve or otherwise change some aspect of the status quo, is to serve as the successful advocate of an innovation. This is equally true whether the innovation is a physical object, such as a computer, an idea, such as democracy, or some hybrid of the two, such as a new instructional package.

Much thought and some research has been devoted to the development of a technology whose purpose is to accelerate the rate at which innovations are spread, or diffused, throughout their target populations. That technology is instructional development. The present section consists of seven chapters divided into two subsections, "Theories" and "Applications." These chapters treat various aspects of that technology, from various viewpoints.

The first subsection consists of three chapters treating the theory of diffusion. Chapter 28 deals with a theoretical perspective based upon the work of an anthropologist, H. J. Barnett. His work has not received as much attention from instructional developers as it probably deserves, and perhaps this chapter will rectify this. Chapter 29 presents an approach to a branch of diffusion theory (also called knowledge utilization) known as **Linking**. The particular approach presented here is related to the earlier chapter by Hutchinson, and should serve to provide a concrete example of his approach to model building. Chapter 30 provides a review of the literature on the diffusion of innovations, and relates this literature to the instructional development field.

The second subsection deals with applications of diffusion theory to particular problems and settings encountered by instructional developers. Chapter 31 of this section deals with FD, OD and ID, and how they are related through the diffusion process. Chapter 32 examines an application of the concept of readiness to a program in faculty development. Chapters 33 and 34 examine problems encountered in university settings, and which are related to factors affecting how instructional development is received in this setting.

The significance of these chapters stems from the fact that instructional development, no matter how well performed, is useless unless its products are used, and none of us are free from considering this fact. Even when the ID shop is dedicated to providing exactly what one set of clients wants, these clients must from time to time become adoptors of innovations advocated by the instructional developer or the shop will become an expensive and expendable luxury.

A. Theories

28. Innovation and Diffusion--An Anthropological View. Brian M. du Toit.
29. Linking Knowledge Production and Needs of Knowledge Users. W. C. Wolf, Jr.
30. Evaluating Instructional Development Projects: Guidance From the Literature on Change. Joseph J. Durzo and Barbara M. Florini.

B. Applications

31. Faculty Development (FD), Organizational Development (OD), and Instructional Development (ID): Choosing an Orientation. Allen J. Abedor and Steven G. Sachs.
32. Toward a Faculty Self-Appraisal and Development Program--A Readiness Based Approach. Ron J. McBeath.
33. I.D. in Higher Education: A Parados. William R. Terrell and Sharon A. Shrock.
34. Promoting the Liberal Arts and Instructional Development. Robin E. Lawrason.

A. THEORIES

Chapter 28

Innovation and Diffusion — An Anthropological View

Brian M. du Toit

The works of Rogers and Havelock are well known in most instructional development programs as providers of valuable information as to techniques for diffusion of innovations. Yet another equally important source of information concerning the diffusion of innovations often goes unnoticed. The work of Barnett and others—an anthropological approach to diffusion of innovations—is the subject of this chapter, a chapter which should greatly enrich understanding of the process for most developers.

When academicians are invited to participate in a discourse in disciplines quite different from the one in which they were trained, they venture into a situation fraught with potential misinterpretation and terminological diversity. For this reason it is essential to clarify and agree on the terms to be used and to explain contextual variations. When this discourse pertains to disciplines which are not very different and which deal with the same subject matter, the problem is complicated. Readers always have a logical working knowledge of terms and these make sense in the context in which they operate. The use of terms in a way which diverges too drastically obstructs communication and it is therefore essential to clarify how such key terms will be used.

This chapter will explore the broad area of culture and **planned** culture change while giving special attention to innovation and diffusion. The subject is approached from a social antrhopological perspective and applied to the field of education. The courtship between the two disciplines has unfortunately in the past too often lead to a tryst rather than a marriage. It is hoped that the current venture will result in a more "meaningful relationship" between education and anthropology.

CLARIFICATION OF CONCEPTS

Anthropologists, ever since the discipline was first recognized, have tended to contradict their own basic teaching. Anthropology is the ανθροξ loyos, the "study of man" (embracing woman, as is sometimes humorously pointed out) yet every student must learn how an ever growing number of crown princes of the discipline have defined **culture.** Anthropology for some, then, becomes the study of culture (i.e., culturology as White (1949) states) rather than the study of people. The waste of time and energy in this venture is clear from the fact that this "culture" which at first differentiated between **homo sapiens** and non-(or less) sapient forms, and involved speech and tool use which could be taught to a next generation, has progressively been redefined. As evidence of tool use, tool making, communication and experience transfer among primates and other biological forms appeared, culturologists have been back-peddling because they were, in fact, looking at the products of culture rather than at the culture, and because they wanted to use culture as a distinguishing feature rather than emphasizing its characteristics.

So complicated and cluttered had the field become that by 1952 Kroeber and Kluckhohn published an encyclopaedic compendium containing at least 150 definitions of culture and statements about the concept. These range all the way from seeing culture as Kroeber originally did, "as a unique, objective level of reality, self-sustaining and self-generating (sui generis)" (Brameld 1963:88) to Racliffe-Brown's position that the word "culture" denotes "not any concrete reality, but an abstraction" (1952:190).

Inasmuch as people's conception of such a key concept will also influence the way they think about related terms and processes, it is essential to arrive at a practical working definition.

There are four basic areas in which clarification is needed if a workable concept of culture is to be formed. These are (a) culture is an abstraction; (b) culture is ideational; (c) culture is dynamic; and (d) culture is learned.

Most persons these days agree that culture is not a thing **sui generis,** that it is not superorganic, that it is not extrasomatic, and that it must be found in the behavior of people. But it is essential that we go one step further in recognizing that what we refer to as culture is abstracted from the thoughts and actions of individuals being observed. The New Zealand anthropologists Beaglehole and Beaglehole (1946:15) state that in studying the culture of a group, the social scientist "must abstract and generalize from the private experiences of as many informants as he is able to study." Benedict illustrates this slightly differently when she says that "cultural configurations stand to the understanding of group behavior in the relation that personality types stand to the understanding of individual behavior..." (1932:23). **Culture must then be seen as an abstraction** which in very general terms represents the behavior of individuals and that which gives rise to such behavior. Strictly speaking, we always deal with the culture of an individual, but this individual behavior would be designated idiosyncratic were it not shared by other members of the social group. Thus, whether we are referring to the residents of an isolated traditional village or urbanites in a modern megalopolis, we must always start our observation at the individual level and abstract from behavior patterns that are shared results from an ideational base, for "An analysis of culture, if fully carried out, leads back to the individual mind" (Goldenweiser, 1933:59).

Every reader will agree with the designation **homo sapiens,** and with the accompanying clarification that sapient forms are able to symbolize and to abstract. Ideas allow the individual mental images, some of which are given behavioral and others physical expression while some remain at the ideational level. As long ago as 1916 Wissler said that "a culture is a definite association complex of ideas" (1916:197). While we have to be careful of the concept of "stream" and the way this stream of ideas "passes" from generation to generation, we might also agree with Ford's position that "culture may be briefly defined as a stream of ideas, that passes from individual to individual by means of symbolic action, verbal instruction, or imitation" (1949:38).

Culture, I would suggest, **must be seen as ideas and idea constellations,** some of which remain at the ideational level while others are expressed in behavioral or material form. Culture becomes significant only when these ideas or their representations are shared. This allows us the shorthand reference to the culture of the group, e.g., student culture, Gainesville, Florida, culture, or American culture. I find no fault with speaking about culture in this sense provided we keep in mind that we are discussing an abstraction and provided we do not ascribe superorganic qualities to it. The latter unfortunately is a trap which, unless consciously avoided, ensnares the social scientist. Barnett states that "it is usually denied that culture is or does anything, materially speaking. Yet, typically, theories and models and explanations are framed in terms which belie the denial. From the beginning of its conceptualization as a standard, average, or ideal of behavior, the idea of culture has taken on the properties of an entity independent of the human beings who are supposed to be molded or guided by it" (1954:1001). Without realizing the shift, a writer may suggest that culture grows, determines behavior, flows its course, accumulates and dies. What is happening, of course, is that an idea is credited with the properties of a thing; an abstraction becomes an entity.

A question which might arise at this point pertains to the subject of the abstraction and who is involved in this process. Social scientists have long recognized the fact that concepts such as culture, society, systems, and so forth are conceived and used essentially as heuristic devices. They are thus formulations in the head of the researcher rather than existing "out there." It would be safe to suggest that no person fully internalizes the culture of the group in which s/he lives, nor do they consider their thoughts and behaviors in a holistic sense. People do recognize their life style and tradition, contrasting it with that of their neighbors, but this recognition of differences is usually of a different nature than that described by the social scientist. It usually includes a geographical and an ethnic referent and is more subjective than that of the "scientist." We should also keep in mind that there usually is a difference between the ideal and the real patterns of behavior. This is due in part to idealism of how people would like something to be or to be performed in contrast with the way it is, but also to the very fact of cultural dynamics. The way people remember something and the way they would like to see it are based upon past experiences or thought patterns and do not allow for continuous growth and change. This concept also has importance in the field of education, in which ideal concepts, curricula or methods might be out of step with the modern situation.

But we need to make one more point, which is based upon and derived from the previous two, namely, that **culture is dynamic**. This needs to be seen in the light of the foregoing discussion rather than standing on its own. If culture is an abstraction based upon ideas and ideational constructs, then it also is implied that it continuously changes as ideas change in response to sensory and other stimuli. As the ideas change so do the configurations of which they are a part, and so also do the behavioral and material forms representing them. People are in a continuous state of exposure to sound, sight, feeling, touch, taste, smell and other stimuli. These result in an ongoing interplay between that which was experienced and that which is experienced, changing imperceptibly or dramatically the ideational base and resultant expression of a person's culture. To insist, therefore, that the very definition of culture includes change is clear, and to state that "culture change" is really redundant is an outflow of this position. Culture is in a constant state of flux, but the change may be directed and the rate of this change may be increased. We shall return to this point below. The implication of this statement is that a person's culture changes as s/he meets new situations, is exposed to new ideas, experiences novel behavior forms. What the person is responding to is the stimuli in the new situation, not some invisible force, and s/he is internalizing the stimuli against her/his own experiences, personality, and values. I would then disagree very strongly with White who states that "No people makes its own culture; it inherits it ready-made from its ancestors or borrows it from its neighbors" (1949:337). But how, we would ask, does culture change occur if we simply accept it ready- made rather than making any input, and again White explains:

> To be sure, there is 'something outside one's self,' a power, a force, that lays hold of one and compels him to do thus and so. But there is nothing mysterious or mystical about it. It is not something unearthly or divine as Goethe suggested. It is simply the great tradition of culture that holds each one of us in its powerful embrace. When, as if in a river, we are caught up in a current or rapids of culture change, or swept into the vortex of cultural synthesis, we can do naught but give ourselves wholly to it. Then indeed do we feel a spirit not our own. But we know whence it comes and what its nature is. It is the great and cumulative stream of human culture, flowing down to us from its sources in antiquity, carrying us upon its bosom, nourishing and sustaining us, using, but yet preserving rather than consuming us for the culture and the generations yet to come (1949:298).

Such evolutionism is expressed in slightly different terms by Steward (1955), and while his interpretation allows for multilinear rather than unilinear evolution, it still denies the role of the individual and removes the latter from the cultural process.

But let us return to the main argument. It has been suggested that what we normally speak of as culture is really an abstraction deduced from the ideas and idea- based expressions of individuals and furthermore that this is continuously changing as the person is exposed to new stimuli. Since this culture is continuously changing it must be based upon a process of reacting to stimuli and thus to a **process of learning**. Young says the term culture "refers to the more or less organized and persistent patterns of habits, ideas, attitudes, and values which are passed on to the newborn child from his elders or by others as he grows up" (1945:7). Slightly different is the view of Opler who sees it "as the sum total of learned techniques, ideas, and activities which a group uses in the business of living" (1947:8), while cultural behavior denotes "all human functioning that conforms to patterns learned from other persons" (Haring 1949:29). In all three of these definitional statements we find an emphasis on learning. This is due to the fact that the human infant is born with an almost endless potential and internalizes stimuli presented initially in touch, vision, taste and smell. As shared symbols are learned other forms of communication develop. But we must remember that those who are teaching are initially much more enthusiastic than those who are learning and there is a good reason for this. Those who teach have an interest in assuring that the new or younger members of the group perpetuate the values which they hold. Thus a mother, father, or sibling will present information and reward learning by an infant or child in keeping with their own (individual) culture. The result is that a great deal of cultural continuity results.

One of the most interesting examples along these lines occurs in the context of second- and third-generation Americans. The former do everything possible to look, sound and act like Americans and they are usually supported in this by their immigrant parents who do not want their youngsters to appear different and do want them to be able to compete equally. When the third-generation starts schooling they exhibit more enthusiasm for learning the old culture (including folklore, language, recipes and the like) than their parents have for teaching it. In many cases their enthusiasm goes unrewarded because the parents have forgotten the old ways and the grandparents are deceased. This aspect of continuity and learning is central to the concept of ethnic roots as is the revived interest by Native Americans in their traditions. While it is beyond the scope of the present discussion, this theme is very closely linked to the bicultural and bilingual programs which are being instituted at various levels of state and county education.

Social scientists speak of socialization and enculturation as distinct from education. They use the former term to describe those processes (much of which are subconscious and based upon rewarded behavior) by which the young are assisted to assume roles in the social system in which they live or to share the ideas, acts and artifacts of the group among whom they live. The more technical differences between socialization and enculturation, which need not concern us here, have been discussed by Mead (1963). Normally, in traditional societies, these processes differ only slightly from education. From an early age children are presented with the desirable and "right" ways of behaving, and with the right tools to use in specific situations. The result of this education is relative homeostasis in the person and relative continuity in the acts and artifacts of group members. It assures that the new generation will be imbued with the value-orientations, knowledge, and existential premises of the older generation. It assures that the traditional pattern of life will not be disturbed too greatly. Mead states that "primitive education was a process by which continuity was maintained between parents and children, even if the actual teacher was not a parent but a maternal uncle or a shaman" (1943:637). While education, socialization and enculturation in traditional societies were almost synonymous (in fact Durkheim speaks of "education as the "systematic socialization of the young generation by adults" [1956:124]), Twentieth Century industrial countries have given education a new meaning. For our purposes, however, both result in cultural transfer, i.e., in providing the person with the ideas and idea-constellations which are either new or qualitatively different.

Without entering into a full discussion, we should differentiate between formal and informal education. Speaking of socialization, Mayer (1970) contrasts "practices" and "processes." The former refers to vernacular activities in which the actors specifically aim at socialization. This would include traditional education in which training in attitude and role-playing skills is the objective. But this may in fact not be as successful as the actor wishes and the real socialization or education may in fact be going elsewhere. These are the "processes" which actually help people in acquiring useful attitudes and skills. A great deal of enculturation occurs in the formal setting where skills are taught and attitudes are plied but equally as important are the situation and context, the example and role model, and the opportunities and stimuli. We must also realize that modern Western education (particularly schooling) involves some critical discontinuities--discontinuities which are as much a part of the educational system as they are of our cultural conditioning. Benedict (1938) years ago pointed out some of these and as the period of dependence has increased so have the discontinuities, linked as they are to economic dependence, learner-teacher roles, peer pressure, barrenness of ritual and so forth.

The last term which should be clarified is diffusion. In a later section of this chapter we will deal more fully with the process, but here it is necessary to tie it in with the concepts of culture, culture change, and education. Generally speaking, diffusion refers to the spread of a belief, act or artifact from one group to another. As was the case with culture, persons who use this term may be able to clarify what they mean by the term but in the next breath will suggest that diffusion is "the transmission of elements from one culture to another" (Webster's). Now it is obvious that "cultures" do not transmit or receive. People may be exposed to new ideas or may be presented with elements about which they form ideas and they may then decide to accept or reject such new elements or to reinterpret them. But people never accept new ideas (or their representations) unless there is some positive value attached to them. As Barnett has pointed out: "all acceptance is diffusion, and all diffusion is stimulus diffusion when the acceptance of a new idea is understood as a mental process of the accepter and not as a logical construct to explain resemblances" (1953:332). All culture change, due to contact among people or due to conscious efforts to induce change, must thus be seen as diffusion. It must be differentiated from internal change, or innovation, where mental recombinations result in new expressions, be this a new dance form or a better mousetrap.

PLANNED CULTURAL CHANGE

If we accept the premise that culture is in the last analysis a mental construct and that acceptance or rejection of diffusion elements thus also occurs at the ideational level, then it should be possible to plan cultural change. Such planning would involve presenting a person or persons with those alternatives which would cause change in the direction the planner wished. It could also involve baiting the alternatives so that the person confronted with the choice felt that something would be gained by the selection and resultant change. All behavior, of course, involves optative features and most choices are made in self-interest--because there are short-term or long-term gains to be derived from the choice.

Education in the U.S., I would suggest, is a special kind of "directed" or "planned" cultural change. A team of personnel conspire to present specially selected information, using media which have been tried for their effectiveness, to present a child with ideas and their products in such a way that these ideas and products (behavioral and material) gain selectivity value. The selected information is also known as a curriculum and the change agents are known as teachers. Hopefully the children, known as pupils, value the information presented (they have to if they want to progress) and in time acquire certain empirical knowledge, certain socially acceptable behavioral forms, and certain skills. The greater the resemblance between the ideal (envisioned by teacher planners) and the pupil's achievements, the greater the resemblance between the blueprint, and the product, the greater the success of the planned culture change project.

The unique fact about our educational system is that enquiring, questioning, and experimentation are encouraged and rewarded. The student who memorizes required factual data may perform with satisfaction but the one who ends each sentence with an insatiable "Why?" is the one who will excell, basically because s/he has been enculturated to express the values planners place on this element of education. The ability of students is measured by their performance, and teachers want as many "good" and as few "bad" students as possible. "Good" students are those who perform as the teacher wants them to perform. "Bad" students do exactly the opposite.

THE CULTURE OF THE CLASSROOM

If is an accepted and provable proposition that those persons who come from a common background and who spend the greatest amount of time together, will have the largest number of shared ideas. This is due to communication, interaction and imitation. In short, we say that those who come from a common background have a common culture. This cultural referent has both a geographical and a temporal aspect. We not only find that Midwesterners contrast with Southerners or urbanites with rural dwellers but also that those socialized during the 1940s contrast in certain respects with those socialized in the 1960s. We even speak of a generation gap.

To a lesser extent, but as critical, is the difference between different age, sex and ethnic categories of a school's population. While it is easy to establish sex differences, it becomes more problematical to detect nuances of ethnic, class and other differences among students. One thing is certain: most students, as a category, contrast with most teachers. This allows us to speak of the former as having a "culture" which, with reference to this time and place, is quite different from that of the authority figures in the school system.

The "culture" we are delineating here is composed of ideas, values, interaction frequency and intensity, linguistic referents, and behavioral forms. When students speak of "bad" and mean good, of "cool" or "hot" as meaning acceptable, and of a "killer" or "wild" movie when they indicate one they recommend, we are dealing with group-specific shared meanings. When instead of a congratulation a student says "give me five," or instead of a handshake one is instructed to "slip me some skin," it is obvious that there are cultural differences.

Using values, which guide the optative features of a culture, as a central theme we can follow Spindler in his delineation of different groups in an educational community. He sees "culture as a goal-oriented system" (1963:132). As different groups or sub-groups are oriented toward different goals, i.e., have different value systems, it is possible to arrange them on a continuum between the traditional educational values and the emergent values which are a product of growing up and coming to terms with the present. It is important to return again to the individual who is choosing between alternatives, who is experiencing challenges, and who is coming to terms with persons and situations. In some cases this process is relatively harmonious, in others it is marked by conflict. "The conflict goes beyond groups and institutions, because individuals, in our transitional society, are likely to hold elements of both (traditional and emergent) value systems concomitantly" (Spindler 1963:138). Following Spindler, then, we can delineate a number of cultures in the educational community (See Figure 28-1).

The culture of the classroom as represented by students, is overseen by a teacher who represents a different culture. The classroom as a whole, as a social system (Parsons, 1959), can also be contrasted with the school administrators. When we remember the politics of power and where the authority is, we can readily expect a clash. Those who hold to traditional values and are in general more conservative are also those with the power and authority, and conversely those with least authority are those who are on the forefront of emergent values, of alternatives, of "culture change."

TEACHING AND LEARNING

If we use the same schema presented above, but turn it to a vertical axis, it better represents

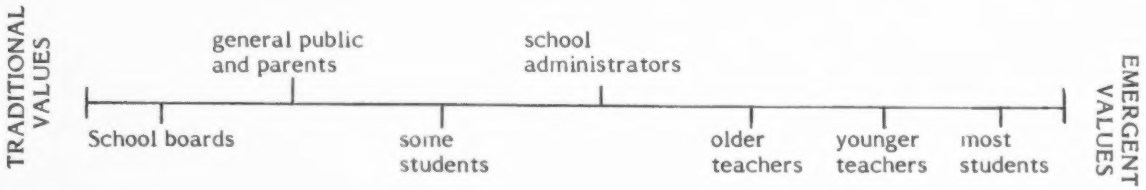

Figure 28-1. Cultures in the educational community.

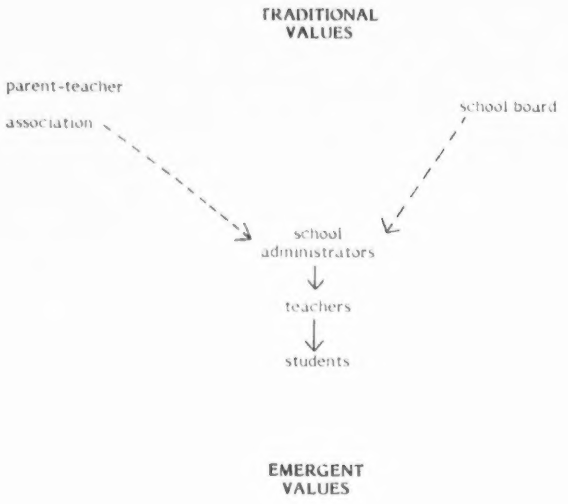

Figure 28-2.

both the authority component and the learning requirements. In a very general sense then we might think of the set-up as follows (See Figure 28-2).

The upper levels are of less concern to this study than are the lower levels. Of critical importance is the fact that within the teacher category those with more seniority (usually coincident with age) have the greatest influence and are the most conservative in terms of traditional values. The students who are most directly involved with emergent values are those who are required to satisfy the authority figures. The students must accept, in principle at least, the values and behaviors laid down by teachers and administrators, and those who are best at acceptance (or faking acceptance) are those who are deemed to perform best. These traditional values include studying, performing well on examinations, and learning what is offered. Transfer of traditional values is absolutely essential to cultural continuity and a degree of cultural integration.

We should, however, keep in mind that the classroom has all the makings of a battleground. Students are "confronted" by a representative of the authority group. Students represent new forms of behaving, new values, new ideas. They are present in numbers while the teacher is alone. But those who back a student are usually other students while those who back a teacher are members of the authority component of the school system. The battle lines are drawn; the confrontation seems inevitable. However, battles seldom occur. The reason is, of course, that the student increasingly is enculturated and learns that role-performance is rewarding. The status of "good student" requires a role performance which satisfies authorities (and some other students) and as time passes the more senior students start to perform roles which represent their transition from student to the next phase.

One of the most ingenious defusing mechanisms in this context was the appointment and later election of student government, class presidents, and student representatives. Their learning has taken a slight turn and their status requires them to take a mediating role. This same mechanism is used in the appointment or election of faculty as advisors to clubs or teams, or students to faculty committees (even if they are non-voting members), of teachers as school principals, of parents as faculty advisors and so forth. The role of these intermediaries is that of cultural "broker."

Anthropologists in the past have spoken of cultural "mediators," "hinges," or "brokers," as descriptions of the role of middleman between a local peasant community and outside organizations (Gamst 1974:46). In his use of cultural broker Wolf has been quite specific about the definition of the term. Brokers "stand guard over the critical junctures or synapses of relationships, which connect the local system to the larger whole" (1956:1975). If we think of the classroom or the school as a system with its own culture, then these persons who "stand guard" and who act as arbitrators between this system and society at large are in fact mediators or brokers. Silverman clarifies this role as follows: "It seems to be general that there is a rank difference between the mediator and the other persons in the local system who are involved in the mediated interaction. The mediators may take on their function because of previous possession of a higher rank, or they may achieve a higher rank as a result of assuming the mediator role. In either case, the relationship between the local and the national system assumes a vertical form (1965:173). Vertical here has both structural and functional implications. In its structural sense it implies the authority component discussed earlier in this section, and in its functional sense it implies the prestige and role of the broker who is mentally and behaviorally closer to the outside larger whole than most of the members of the subsystem. The broker performs a two-way role representing each system to the other.

MECHANISMS AND RESOURCES

In his discussion of social change, Niehoff (1966:40-41) distinguishes a number of forces which influence the change process. Among those which he sees as being of primary importance, are the following: (1) the methods of communication used by the change agent, (2) the kind of participation received from the recipients, and (3) the manner in which the change agent utilizes and adapts the innovation to the existing cultural patterns. But social change is a two-way action; it requires response from the recipients. The primary variables are (4) whether they have an initial felt need, (5) whether they perceive practical benefit in adopting a change and (6) whether their (traditional) leaders are brought into the planning and implementation of the process.

Even though Niehoff was discussing international changes in developing areas, the processes apply equally to the social context we are discussing. The school and the classroom in fact represents a sociocultural unit. The persons who constitute a school population or a class contrast at various levels in a cultural sense with nonmembers. The teacher is in fact involved in a project of planned cultural change, introducing a specific program (which we may call a curriculum) in the hope of changing the student culture in those areas valued by the school board and administration. The teacher's success as change agent is measured by the student response. The degree of cultural change among students is measured by their level of satisfying the requirements of the administration. Increasingly this process is being facilitated by the use of various technical and mechanical resources--resources which must be acceptable to teacher and student for there to be any measure of success. In many cases the acceptance or rejection of such devices follow the same basic processes as is followed by any innovation.

Many years ago, in speaking of international aid, Furnivall said that a people must be made to want what they need. I believe that the teacher is in the same role, making students want certain tools, certain empirical knowledge, certain abilities of reason and logic, not because these are useful but because they are necessary. However, the need must be subjectively experienced in order that value be placed on things (abstract and material) which can satisfy it. Two important points should be made here: firstly those who are expected to change must be involved, incorporating them in the process, using their leaders, and involving their cultural background. Secondly innovations must be meaningful and contextual. To use closed-circuit television in the New Guinea highlands would be as ill-conceived as teaching a kid in Chicago to count breadfruit or coconut-crabs. The New York child responds better to images of automobiles and trucks than images of horses and cows. The child accustomed to watching the Saturday morning cartoons will respond well to the same device for teaching ("Sesame Street" or other educational television programs). The important point is that the media do not interfere with the message, the media are part of the culture and thus do not detract from the communication process. It is in this same context that teacher's aids, student assistants, and tutors are of such value. It is also the reasoning behind the recognition of class presidents and student government.

Above it was suggested that innovations must be meaningful and contextual. These are in fact prerequisites for the acceptance of any innovation.

INNOVATION

Barnett defines an innovation as "any thought, behavior, or thing that is new because it is qualitatively different from existing forms. Strictly speaking, every innovation is an idea, or a constellation of ideas; but some innovations by their nature must remain mental organizations only, whereas others may be given overt and tangible expression. Innovation is therefore a comprehensive term covering all kinds of mental constructs, whether they can be given sensible representation or not" (1953:7). This concept has direct application to the educational process we are discussing.

It will be recalled that in the clarification of concepts above, it was proposed that culture is an abstraction and that it is ideational. Culture change, by the same criteria, would involve ideational change. Planned cultural change would involve presenting the client community with those novel elements which they "should" want. But there is very little chance of persons accepting these elements unless they value them. The success of any program of planned cultural change is then to create needs and to package the innovation in such a way that it can be accepted and integrated into existing mental configurations.

This process, normally referred to as a substitution, permits the innovator to present something that is qualitatively new or different into a familiar context, or to present something that is familiar into a new context. The result is possibly temporary confusion as a "sorting out" takes place on the mental level. But "a real confusion of two ideas means something more than a passive neglect of differences. It means that they are treated alike in some respect. They are given the same meaning, or they have the same functions. In brief, one substitutes for the other within the framework of some prototype" (Barnett, 1953:207). A number of the more obvious examples are to be found in the realm of audiovisual teaching aids, students as teaching assistants, and more recently the blossoming area of computer devices. Instead of writing mathematical problems and solving them in a book, a child now can test mathematical skills with a computer which is programmed at a specific degree of complexity. Instructors have always been innovative, and the state of the art is a direct result of their initiative and success. The most successful media innovators are those who are conscious of the cultural background of their students and who gear such innovations to the time, place and setting. But the innovation, however well conceived, will abort unless it is accepted and integrated. Acceptance depends to a great extent on those who are willing to advocate the use of an innovation. Educational television will have little impact among the Amish--not because it is educational but because it is television.

ADVOCATES OF CHANGE

Rarely is an innovation accepted without somebody advocating it, even if this merely implies using something or performing an activity. In most cases innovations are advocated more consciously by a person who tries to make others accept the new idea. When such growth of popularity of a new idea occurs within the boundaries of the original group we call it "acceptance"; when it occurs across boundaries we call it "diffusion." But we must keep in mind that "boundaries" can be variously defined. They may be vertical or horizontal, and they may differentiate national domains as much as they may differentiate social or private domains. Boundaries then may mark off nation-states, as well as social classes; they may be used to define wealthy versus poor just as they may define students versus teachers. Boundaries are arbitrary and may be crossed or in time become obscured, but at any point in time they serve a purpose of circumscribing categories of human beings. The crossing of such boundaries results in diffusion.

Acceptance is not inevitable. Acceptance of new ideas in the educational context depends to a great extent upon the context and the advocates. Normally these advocates for change are teachers. But Mr. Smith is not necessarily the best advocate unless he is in the right context; Ms. Brown has certain and specific advantages as an advocate for one specific innovation but not another. The football coach would not necessarily be the best person to introduce a new mathematics device, nor the librarian the best person to advocate acceptance of a new tool for physical education. Barnett points out that "no person serves as an exemplar in the particular area of his preeminence for everyone who knows him; and...no one is so versatile that he is a universal exemplar in every area of interest that is valued by those who know him" (1953:314). Even within the same context, personalities and attitudes differ, as do manner and procedure. Young differentiates the "poised teacher", the "formal teacher", the "male hero", and the "possessive teacher of starved emotions" (1957:383-385). Each of these types will appeal to certain persons, will be effective in certain contexts, and as advocates will be successful in influencing adoption of certain innovations.

Their role as advocates for change may then be to gain acceptance or to achieve diffusion. Just as all diffusion is really stimulus diffusion, so all education is really planned cultural change. The teacher may use tried and accepted methods, contexts, and resources, or advocate acceptance of innovations. This acceptance is in reality diffusion as the teacher is able to transcend the boundaries between teacher and administration, or teacher and students. The acceptance of this innovation by administrators or students is really stimulus diffusion because the teacher either promises results to the administration or rewards learning among students. The choice between accepting or rejecting the innovation advocated by the right teacher at the right time is not a true choice. The alternatives are baited in favor of acceptance. Diffusion is likely since the advantages are exemplified and the disadvantages ignored.

RETROSPECT

We set out to discuss innovation and diffusion and found that a great deal of groundwork was necessary to establish a terminological frame of reference. We also found it useful to look at the classroom and the school as sub-systems with cultural characteristics which were somewhat unique to them. The aim of education is universally decided and expressed by those who teach rather than those who learn, but in order to achieve these aims those who teach must innovate and attempt to diffuse both their material and their ideals among those who learn. In this process of teaching a variety of teaching aids are used. A teaching aid, says Birdwhistell, "is any device utilized in the strategy of the curriculum to implement the transmission process integral to the special communication system of education" (1963:49). Obviously certain subjects or certain topics of a subject lend themselves to teaching aids but the innovator who is able to advocate a new teaching aid may be able to assure its acceptance and thus its incorporation into the education process.

No ingenuity on the part of a teacher and no originality on the part of an innovator will succeed unless the innovation is accepted. No innovation will be accepted unless it is integrated as an ideational configuration. As the student conceptualizes the novelty, and as its advocates are able to assure its acceptance and incorporation, diffusion is complete.

IMPLICATIONS FOR INSTRUCTIONAL DEVELOPMENT

For the instructional developer, the anthropological viewpoint discussed here has importance for several reasons.

This viewpoint clarifies for us what an innovation is. Namely, an innovation is a change in the psychological state of the originator and/or the adopter.

This viewpoint also clarifies the question concerning whether an innovation should be spread as it is, in a tamper-proof form, or whether it should be adapted to each individual situation in which it is adopted. Clearly, all innovations are invented anew by each adopter. Thus the psychological process of invention must be repeated by each adopter. When this happens, the resulting "invention" will automatically be somewhat different from any other form the innovation has ever had, since each adopter has a somewhat different viewpoint s/he is working from. Thus we cannot ever "drop" an innovation, intact, into a new situation. Whether we deliberately adapt it or not, it will be modified. Conversely, if it cannot truly be adapted, it cannot truly be adopted, and will eventually be dropped. Examples of this happening are supplied by early work with packaged language laboratories and by the public school experience with the PSSC Physics material.

More importantly, the Barnett model of diffusion changes our focus of interest. With most current models we deal with statistical properties of the change process. We try to reduce the complexity of the change process to a system of interrelated variables representing externally-observable characteristics and events within a social, political or communications system. Barnett causes us to focus upon the single individual, and deals with this individual as perceiving, thinking awareness operating within a particular world-view. An innovation is seen as a particular kind of perceptual operation which takes place within the individual.

Barnett is aware of the various "objective" variables, such as pay-offs for the adopter, status risk, and gatekeeper functions, that can be shown to have an effect upon the fate of an adoption. However, for him, the main question for the instructional developer to consider must be, how can the change agent facilitate the occurrance of the appropriate perceptual events within the potential adopter?

This viewpoint is in some ways more appropriate for the instructional developer than is one derived from sociology or mass communications research. More often than not, the developer is working with either one individual or a small group of individuals; seldom is s/he working with a whole community in which each individual must adopt the innovation for the project to be successful. Even when one is designing a training system for use by a company with several hundred employees, or for use by the military, with perhaps several thousand employees, the actual adopters seldom number more than eight or ten.

While status-risk can be measured for these individuals, and the responses of their gatekeepers can be determined (and these things are important to do), the real problem is how to facilitate these few individual's favorable perceptions of the innovation. How do you establish conditions such that the individual is likely to perceive the true nature of the innovation and its place within the overall system s/he works in? How can you facilitate her/his grasping of the value of the innovation to the system, to her/himself, to her/his reward system and gatekeepers? How can you facilitate her/his perception of her/himself as an adopter of the innovation, or as an advocate of it? If the change agent can satisfactorily facilitate the occurrance of these perceptions within the potential adopter, the potential adopter will probably become an active and powerful advocate of the innovation in question.

Thus, diffusion is seen not as a process involving a great many people, but as a process involving an individual. This is true whether one individual is involved, or whether hundreds of individuals are involved. The diffusion process is really a process involving the multiple repetition of the original act of invention, just as a culture consists of many repetitions through many individuals of the re-invention of a particular world-view, value system and behavioral system. This is not to say that the innovation, or the culture, for that matter, would have come into existence in the mind of the adopter had no one suggested it to her/him. But if the suggestion is to take, it must be processed in the same way as it was in the originator of the idea. This follows from the fact that all inventions, and all adoptions, are ideas; any equipment or materials embodying this idea are secondary; they are not the innovation, but the means of implementing the innovation.

These same principles apply to the interaction between the instructional developer and the subject-matter expert. In many situations subject-matter experts have no training in education or presentation techniques. At best, some of these experts present information to their students in ways which they have found most beneficial to their own learning style. They may present information in the way it was originally presented to them, or they may not present the information at all other than through holding students responsible for knowing it.

If instructional changes (i.e., planned cultural changes) are to be effected it is imperative for the instructional developer to accurately assess the training and background of the subject-matter expert with whom s/he is working. For success of planned cultural change requires that a need be created and that information be packaged so it can be accepted and integrated into existing mental configurations. This, of course, requires that the instructional developer know if s/he is attempting to substitute a different approach into a familiar context or a familiar approach into a new context.

A related implication for the instructional developer follows from this. For the IDer not only is involved with the diffusion of existing ideas, but also with the origination of new ideas to solve particular problems as s/he encounters them. But since, as Barnett demonstrates, an act of invention and an act of adoption are essentially the same acts, psychologically, with the exception of the facilitating conditions being at least partially supplied for the adopter, it would seem both possible and useful to provide ways to provide the innovator with methods for self-facilitation. This has been attempted to some degree already, with such techniques as brainstorming and think tanks. But further progress along these lines should result from an analysis of the diffusion process with the innovator in mind. For whatever methods aid in the spread of an innovation should, when properly modified to allow self-application, aid in the origination of innovations.

Barnett shows where to look for information concerning the facilitation of these internal processes. In his book, Innovation: The Basis of

Cultural Change, Barnett devotes considerable space to the delineation of the internal processes involved in the innovation/diffusion process. His analysis is based upon a psychological perspective that is perhaps not as acceptable to many as it might have been once. Nevertheless, it can serve as a model for the development of a technology of diffusion and of innovation based upon the psychology of conceptual development within the individual, using whatever psychological perspective happens to be popular at the time. For, whether through information processing, radical behaviorism, cognitive learning theory or some other theoretical approach, such a technology must be based upon the way in which the adopter's internal state is modified by stimuli related to the innovation.

A close reading of Barnett also makes clear that in many ways, many of the people the instructional developer typically considers to be clients are members of other cultures, and that many of those we consider to be colleagues are really advocates of opposing cultures. We are, in fact, often involved in "culture clashes," in which we represent one culture and the client represents another. Our colleagues often represent a third culture, in competition with our own to dominate that of the client and her/his environment.

Thus, often what we perceive as a matter of seeing the benefits of a procedure or device in a given setting is, for the client, a situation involving the necessity of a change in world-view. Sometimes a change in self-concept would be required on the part of the client, or a change in a major role the client plays in her/his culture.

Often, when an innovation we are asking a client to adopt requires the cooperation of our colleagues from other departments, we are asking our colleagues to do a very difficult thing. We are asking them to play a role of obvious value, as seen from our cultural perspective, but which might appear useless, ridiculous or even detrimental from within their own culture. For instance, if we belong to a behavioristic orientation, we might ask supervisory teachers to plot the behavior of student-teachers as an aid in their evaluation. We would need the cooperation of the faculty members in the teacher education department, and these professors might belong to a culture with a humanistic outlook. Clearly, if we seriously want this innovation adopted, we are involved in a struggle between two cultures, that of our own and that of the humanistic professors, both attempting to predominate in a struggle to modify the world-view of members of two other cultures, that of the student-teachers and that of the student-teacher supervisors.

Predictions concerning the outcome of such a struggle, or culture clash, can be made, based upon the nature of culture change and culture clashes. This is an area in which Barnett's book can contribute to the practice of the instructional developer; he presents an extensive discussion of culture clashes. This area of discussion should be of value not only from the viewpoint of diffusion/innovation strategy, but also should contribute to our understanding of client-consultant interaction, and to front-end and interface analyses (see appropriate chapters of this book for discussions of these topics).

Of course, these points can be viewed in other ways. It has been empirically established, for example, that a change agent who has a background similar to that of the client is more likely to succeed than is one who has a radically differing background. And an innovation which differs only slightly from the status quo is more likely to be adopted, and to remain in place over a considerable length of time, than is one which requires a major change in the status quo. And this is generally true independent of the potential difference between the two innovations in terms of the amount of systems improvement they result in.

Both of the above facts have been discovered through approaches independent of the Barnettian-anthropological outlook. But they become much more meaningful when viewed through the theoretical framework provided by Barnett, together with the perspective on the nature of culture provided earlier in this chapter. Clearly, communication is easier within a culture than between cultures. And clearly, facilitating conditions are less critical to the occurance of small changes than to the occurance of major changes. From these observations, the earlier empirically-discovered facts can be derived, as can many others. This is more efficient than trying to empirically discover each fact separately. Empirical verification is still necessary, but a predictive science allows more efficient verification than does a non-predictive one.

CONCLUSION

Perhaps, then, the major advantage of the cultural, or anthropological, approach to innovation and diffusion is that it focuses upon the individual, upon internal processes, and upon communities defined in terms of common world-views. It has the advantage of causing, or at least encouraging, the change agent to view her/his proposed innovation through the eyes of the adopter, rather than to view the adopter through the perspective of a set of abstract variables from sociology and communications theory. And it provides a comprehensive theoretical model, an advance organizer if you will, within which to integrate and give meaning to empirically-derived facts and relationships.

None of the approaches to diffusion described in this book, or elsewhere, to the author's knowledge, are mutually exclusive, and this is as true of those emanating from anthropology as it is of those coming from other disciplines. And neither can any of them satisfactorily deal with diffusion by themselves. All of these approaches have their unique contribution to make to our understanding of the change process. What is needed, as is pointed out elsewhere in this book, is an integrative framework within which the findings from each thread of investigation can be woven together, so as to provide maximal guidance to the change agent and to the researcher in diffusion and related areas. Barnett and the other anthropologists provide us with a viable starting point for the development of such an integrative view.

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Chapter 29

Linking Knowledge Production and Needs of Knowledge Users

W.C. Wolf, Jr.

Most new ideas, new techniques, new products fail due to lack of adoption. Why do "good" ideas often suffer the fate of nonacceptance? Probably because the new knowledge which is produced is not properly linked to the needs of knowledge users. This chapter provides a look at the problem just described, analyzes why failures occur and provides approaches for solving the problem through the Wolf-Welsh Linkage Methodology and the Wolf Knowledge Diffusion/Utilization Inventory.

INTRODUCTION

Someone, somewhere can be counted upon to come up with a new product, a new way to do routine tasks, or a new idea, which purportedly will improve the practice of individuals in some useful manner. Count upon the regular **disappearance** of the bulk of these innovations as well. What has been conceived in earnest all too often flops fast. Unfortunately, well-conceived and developed innovations flop at about the same rate as do ill-conceived ones.

"Linkage agents" routinely sift through mounds of new practices, products, and ideas, in order to determine which ones best meet the needs of targeted audiences. Their preferences can determine the effective life-span of innovations. Linkage agents, either inadvertently or deliberately, thus become "information gatekeepers" for their respective disciplines. Their selection of specific seeds, drugs, instructional materials, or mass media messages, for example, can have profound consequences.

Selection is only one aspect of their potential influence. It is not unreasonable to believe that skilled linkage agents can communicate either poorly-conceived or well-conceived innovations equally well. Their ability to modify practice with either kind of innovation can also have profound consequences.

The differential consequences of linkage agents' actions eventually become apparent. For example, some one or some group was responsible for the widespread utilization of the lock-step graded elementary school concept, the rigid desks and chairs used in schools, the pointless equipment installed on many elementary-school playgrounds, and the many incoherent psychometric tests now in use. Conversely, some one or some group was responsible for the widespread utilization of individualized reading kits, "Sesame Street," facilities for "special needs" children and youth, and school-based driver education opportunities. Linkage agents apparently did not routinely take into account the quality or worth of the innovations they offered for adoption.

More is expected of linkage agents today. When people decide to change, they presume that the change will be in a positive direction. Linkage agents are often asked to provide the specific kinds of advice and guidance which are necessary to insure success. Hence, linkage agents assume much more responsibility for **successfully** modifying practice in today's world than they did in the past.

It is the purpose of this chapter: to provide a perspective on knowledge diffusion/utilization theory; to describe patterns of knowledge diffusion/utilization research; and to present selected practical applications of knowledge diffusion/utilization know-how which are apt to have an impact upon the behavior of persons responsible for linking knowledge-production to the needs of knowledge users.

A PERSPECTIVE ON KNOWLEDGE DIFFUSION/UTILIZATION THEORY

James B. Conant noted in an address before the Sixteenth Annual Association for Supervision and Curriculum Development Conference that the trial-and-error method of advancing practical knowledge is successful only to the degree that the experimenter can make a valid judgment as to the outcome of the experiment. He must be in a position to decide whether the outcome of the experiment improves conventional practice in some manner. Accumulated experience and skill developed through long practice are essential in making such judgments in fields where the theoretical component is still small.

In the Middle Ages, Conant observed, it was the skill and experience of the metal-making artisan alone which supplied the basis for a decision. Some cities became famous for the quality of their products during this period; their fame was an outcome of the successful crude evaluations of experienced artisans. Today, chemistry and physics supply concepts and techniques which enable a metal maker to speak with precision about better and worse procedures for making better or worse metallic products. The introduction of a theoretical component into these fields has resulted in a substantial improvement in the criteria used for passing judgment on the outcome of an experiment.

The history of medicine in this century provides another excellent example of the use of fruitful trial-and-error experimentation. Tests of specific hypotheses in the context of extensive practical know-how contributed widely-held theory. The relation of bacteria and viruses to disease is an obvious example.

Advances in practical knowledge are just as cumbersome for many of today's social scientists as they were for the metal-making artisans of the middle ages. Standard operating procedures, which are rooted in accumulated experience and skills, tend to be too personalized to contribute significantly to the evolution of viable theory. Social-change theory, as an example, is a melange of intuition, contention, and evidence.

Social-change theory is more hope than substance. Even though scholars have saturated social-science archives with change theories, models, and configurations, all of which are supposed to have some predictive utility, none survive practical applications. Neither the speculative and amorphous grand theories of social change nor the quasi-experimental contemporary theories of social change provide the kinds of blueprints needed by persons who are involved with the change enterprise.

Knowledge diffusion/utilization theory, a sub-set of social-change theory, accurately mirrors perturbations of the mother theory. Several different conceptual systems which address pertinent facts of diffusion/utilization are recognized; however, each more accurately represents a point of view than a theoretical model. Since persons who write about these systems usually identify them as "models," the word model is used here as well.

Model A.	The Problem-Solver Model
Model B.	The Research Development-and-Diffusion Model
Model C.	The Social-Interaction Model
Model D.	The Linkage Model

Havelock used the word "model" most cautiously as he elaborated upon each.

Model A. Knowledge users' needs are diagnosed, translated into problem statements, and resolved collaboratively. Outside change agents, if utilized, serve in non-directive ways. The model presumes that self-initiated activities are most likely to be implemented and sustained. Model A is a residual of group problem-solving and is identified with the human-relations movement.

Model B. Rational planning from invention to utilization, systematic evaluation, division of labor, and separation of functions and roles typify Model B. Knowledge production is routinely offered to passive, targeted audiences. An important assumption of Model B is that users will accept knowledge if it is offered through an appropriate vehicle, in an appropriate manner, at an appropriate time. The corporate research tradition best illustrates Model B.

Model C. The movement of messages across people and across systems is highlighted. How an innovation is introduced to target audiences and how an innovation spreads within a social system are salient concerns. A belief that people tend to adopt and maintain messages which are perceived as normative for their psychological reference-group is implied. Rural and medical sociologists have developed an extensive body of empirical data within this conceptual system.

Model D. The conceptual system for this model involves a knowledge-user as a problem-solver, a problem-solving **modus operandi** which links the user with a resource system, the generation of solutions which meet the needs of the user, and the application of viable solutions. Knowledge flows back and forth within a complex network of roles and relationships. The federally-initiated National Diffusion Network illustrates a current application of Model D.

Others have offered accounts of diffusion/utilization models which differ somewhat from Havelock's. For example, Sashkin, et al., (1973) described a Planned Change Model and an Action Research Model in the Psychological Review. While they sound unique, neither of the models departs dramatically from the models already described. What Havelock has offered seems to summarize the state-of-the-art of knowledge diffusion/utilization model-building.

None of these "models" seems to be meaningfully related to advances which are taking place in knowledge diffusion/utilization practice, unfortunately. A rather powerful diffusion/utilization research tradition is blossoming within more than half-a-dozen social-science disciplines, which is not associated with any of the conceptual systems mentioned above. Specific research does relate to specific models, of course. However, the tradition seems rooted in the acquisition of experimental evidence and tied to the independent replication of reported research. Numerous advances in practical knowledge seem to be a residual of this process.

Among advances in practical knowledge attributed to the diffusion/utilization research tradition are the following:

1. The development and implementation of many aspects of the U.S. Department of Agriculture's Cooperative Extension Service.
2. The development and implementation of a most effective field-agent role within the pharmaceutical industry.
3. The development and implementation of a national diffusion network to serve professional educators.

The first advance evolved over more than half a century, the second over more than a quarter of a century, and the third over nearly a decade. How one might relate one or more of the previously mentioned diffusion/utilization models to these advances isn't clear.

BUILDING VIABLE KNOWLEDGE DIFFUSION/UTILIZATION KNOW-HOW

Literature scans, covering the period between 1946 and the present, reveal that hard work and creative ingenuity aimed at building viable knowledge diffusion/utilization know-how is being expended. Persons responsible for such inquiry offer varied sets of variables for contemplation as potential determinants of change; they suggest varied ways in which identified variables follow a sequence leading to change; they speculate upon varied ways in which identified variables follow a sequence leading to change; they speculate upon varied ways in which interactions of identified variables bring about change; and they speculate upon ways to proportionally weigh identified variables in relation to each variable's potential impact upon change. Examples of such inquiry are offered in the following paragraphs.

Identifying Variables. Different individuals have offered sets of variables for a number of reasons. Typically, these sets are used to plan diffusion/utilization work, to predict diffusion/utilization outcomes, and/or to diagnose problems within diffusion/utilization endeavors. Examples are offered to clarify each application.

Persons at the Battelle Memorial Institute in Columbus, Ohio, identified twenty-one factors which impacted upon the diffusion of ten outstanding scientific innovations (Globe, 1973). These factors are listed in the order of their significance, which was determined by measuring the frequency of occurrence of each factor during critical incidents in the diffusion of the innovations:

1. Recognition of technical opportunity.
2. Recognition of the need.
3. Internal R & D management.
4. Management venture decision.
5. Availability of funding.
6. Technical entrepreneur.
7. In-house colleagues.
8. Prior demonstration of feasibility.
9. Patent/license considerations.
10. Recognition of scientific opportunity.
11. Technology confluence.
12. Technological gatekeeper.
13. Technology interest group.
14. Competitive pressures.
15. External direction to R & D personnel.
16. General economic factors.
17. Health and environmental factors.
18. Serendipity.
19. Formal market analysis.
20. Political factors.
21. Social factors.

Battelle officials believe that these factors are of probable importance in determining the direction and rate of the innovative process. Hence, awareness of the twenty-one factors may improve the diffusion/utilization planning process.

Zaltman, et al. (1973) studied an array of attributes which semed relevant to describing, explaining, and predicting responses to innovations. Nineteen attributes were identified by them:

1. **Cost**--financial and social, initial and continuing.
2. **Returns to Investment**--tangible and intangible.
3. **Efficiency**--overall timesaving and avoidance of bottlenecks.
4. **Risk and Uncertainty**--on the part of early adopters; lessened for later adopters.
5. **Communicability**--ease of dissemination and clarity of results.
6. **Compatibility**--consistency with "existing values, past experiences, and needs of receivers."
7. **Complexity**--of ideas and in actual implementation.
8. **Scientific Status**--reliability, validity, generality, etc.
9. **Perceived Relative Advantage**--its

visibility and demonstrability.

10. **Point of Origin**--whether from within or from without the organization.
11. **Terminality**--point beyond which adoption becomes less rewarding, useless, or even impossible.
12. **Status Quo Ante**--reversibility and divisibility.
13. **Commitment**--prior attitudinal or behavioral acceptance.
14. **Interpersonal Relationships**--impact on a disruptive integrative continuum.
15. **Publicness versus Privateness**--availability to all members of the social system.
16. **Gatekeepers**--number of approval channels.
17. **Susceptibility to Successive Modification**--ability to refine or modify innovation.
18. **Gateway Capacity**--opening of avenues to other innovations.
19. **Gateway Innovations**--instrumental setting of stage for large-scale innovations.

These attributes are not listed in their order of importance, as was the case of the Battelle example. Rather, each attribute is apt to have a differential effect within a given targeted setting. These effects seem to be related to unique aspects of a targeted setting and to the different stages in the diffusion/utilization process.

Finally, Havelock and Lingwood (1973) offered a set of variables for diagnosing communication problems which occur between senders and receivers. Their set forms the acronym HELP SCORES:

1. **Homophily:** Similarity of characteristics of sender and receiver.
2. **Empathy:** Understanding and feeling for the other and the other's situation.
3. **Linkage:** Contact or relationship between persons or groups.
4. **Proximity:** Placement of persons or groups near each other.
5. **Structuring:** Evidence of planning, ordering, systematic arrangement.
6. **Capacity:** Sign of affluence, talent, experience, wisdom, etc.
7. **Openness:** Sign of willingness to listen, receive, give, tell, etc.
8. **Reward:** Provision of financial support, security, esteem, status, etc.
9. **Energy:** Investment of time and effort, persistence, aggressiveness.
10. **Synergy:** coming together of forces, orchestration, synchronization, etc.

Since each factor can be scaled and then rated, the authors have been able to use HELP SCORES to identify problem-aspects of diffusion/utilization work.

Other sets of variables, which are potential determinants of diffusion/utilization outcomes, are easily uncovered in the literature and can be used to illustrate each of the above-mentioned points. For instance, Davis (1971) offers A VICTORY, an acronym that encompasses eight factors of importance to the diffusion and utilization of new knowledge. And Glaser (1973) conceived CORRECT, an acronym that highlights seven characteristics of new knowledge which seemed to be related to diffusion/utilization consequences.

Perhaps the most promising aspect of these sets is their similarity. Even though the five sets cited above were conceived independently within diverse academic disciplines, all share common variables and common concerns. Some day such similarities may be interwoven by ingenious individuals into a "master" set and then successfully field tested within a variety of academic traditions.

Sequencing Variables. The North Central Rule Sociology Subcommittee for the Study of Diffusion of Farm Practices postulated a five-stage "adoption process" model to account for the **process** of diffusion/utilization that occurs over time. Their model, offered in 1955, attempted to standardize the so-called adoption process. The five stages were:

1. Awareness
2. Interest
3. Evaluation
4. Trial
5. Adoption

No model has recieved more attention in the literature, which is a tribute to the Committee's industry.

There have been numerous attempts since 1955 to refine the adoption process model to make it more functional. Many of these subsequent efforts attempted to relate research being done on relevant variables to stages in the adoption process. Rogers and Shoemaker (1971) describe such a four stage "innovation-decision process." These stages are as follows:

1. Knowledge
2. Persuasion
3. Decision
4. Confirmation

Their model was designed to overcome various criticism of the 1955 adoption process and also to reflect relevent research which had been conducted on the process.

A somewhat different tack was pursued by Hovland (1954), Smith (1946), and Havelock (1969). Havelock, to illustrate this alternative, believed that the process involved an interaction between a user and a resource. He set forth a six-stage formula for analytic purposes. His formula involved:

Who says **what** to **whom** and **what channel** to **what effect** for **what purpose**? Relevant research is easily related to each of the six stages.

More recently, Berman, et al. (1975); affiliated with the Rand Corporation, suggested three stages in the diffusion/utilization process:

1. Initiation
2. Implementation

3. Incorporation

Their conclusion was derived from a study of federal programs supporting educational change.

The trend toward relating research pertaining to salient variables to the process of diffusion/utilization is encouraging, because it gives order to what is known about the variables. If subsequent research reveals that systematic patterns of adoption exist, the revelation will culminate the process begun by the North Central Rural Sociology Subcommittee in 1955.

Variables Interaction and Variable Weighting. Not much is known about either of these matters yet, because both thwart systematic study. Personal variables, organizational variables, and communication variables need to be addressed within specific contexts in order to ascertain interaction effects. Then, interaction effects across contexts need to be addressed in order to prioritize the variables. While some researchers have attempted to address specific aspects of these problems, neither variable interaction nor variable weighting have been studied systematically to date.

Bhola (1965) set forth a configurational theory of the diffusion of innovations which addressed the interaction of variables. He has continued to refine the theory over the years and in 1977 offered a comprehensive publication which summarizes progress being made. Bhola believed optimum diffusion to be a function of four variables (configurations, linkages, environments, and resources) which could be expressed as:

$$D(\text{opt.}) = f\,(C, L, E, R)$$

He believed that the four variables C, L, E, and R must be synergetically optimized to increase the possibility of a change-event occurring. Clark and Guba (1974) have also studied the problem of variable interaction. Their views were put on the record at the annual meeting of the Council for Educational Development and Research, Inc., in 1974. Both Bhola's theory and Clark and Guba's configurational perspective have provided much discussion, but little field application has occurred thus far.

The Battelle researchers, mentioned earlier, prioritized the twenty-one diffusion/utilization factors which were identified, and they also interrelated the factors within six broader themes. Their work serves as a road map for researchers who aspire to study either variable interaction or variable weighting.

Continuing empirical refinement of the work described above is obviously necessary. How to accomplish these refinements so that research outcomes ultimately relate the practice of knowledge diffusion/utilization is not clear.

Unfortunately, persons responsible for linking knowledge production with the needs of knowledge users routinely fail to capitalize upon accomplishments such as those described above. Progress is impeded because what has been learned isn't made available in forms apt to be used by them. And within many disciplines it is not reasonable to believe that linkers are capable of using what has been learned **to engineer** diffusion/utilization **modus operandi** which will bridge the theory-practice gap. The slow pace of meaningful change within disciplines such as education represents mute testament to the expanse between theory and practice.

Researchers need to translate what is known about linking knowledge production with the needs of knowledge users into forms which can be understood by persons responsible for the linkage enterprise. Approaches used to train county extension agents and radar repair persons, for example, provide clues for identifying the steps needed next.

TRANSLATING LINKAGE KNOW-HOW INTO A FORM APT TO MEET NEEDS OF LINKERS

The author, since 1963, has aspired to conceptualize a theoretical diffusion/utilization "configuration" which meaningfully represents the accumulating empirical research on the topic. Every attempt to do so was subjected to intense critical review, then revised as needed or discarded when necessary. Many attempts were required before a configuration was generated which withstood the critical review.

The resulting configuration takes into account variables and processes of importance to knowledge diffusion/utilization. The variables amount to important ingredients needed to successfully expedite diffusion/utilization tasks. The processes amount to directions for combining the ingredients and doing something with them over time.

Think of baking a cake as an appropriate analogy. Certain ingredients (variables) and certain directions (processes) are specified in a recipe for preparing angel food cake. Once the recipe has been proven effective (that is, delicious angel food cakes are produced), the recipe can be used by many people with reasonable success. Someone had to specify the ingredients (variables) and directions (processes) needed to produce an angel food cake. Someone must follow this same procedure--that is, select appropriate variables and processes--to resolve diffusion/utilization problems.

The configuration consists of four classes of variables (conditions for change, characteristics of the innovator, characteristics of the innovation, and characteristics of the target audience) and one class of processes (systems of linkage). Figure 29-1 provides an overview of these variables and processes in relation to outcomes which are conceivable. Researchers typically treat the **classes of variables** as independent variables; the **classes or processes** are treated both as independent and dependent variables; whereas **outcomes** are typically treated as dependent variables.

The configuration described above served as a point of departure for a series of

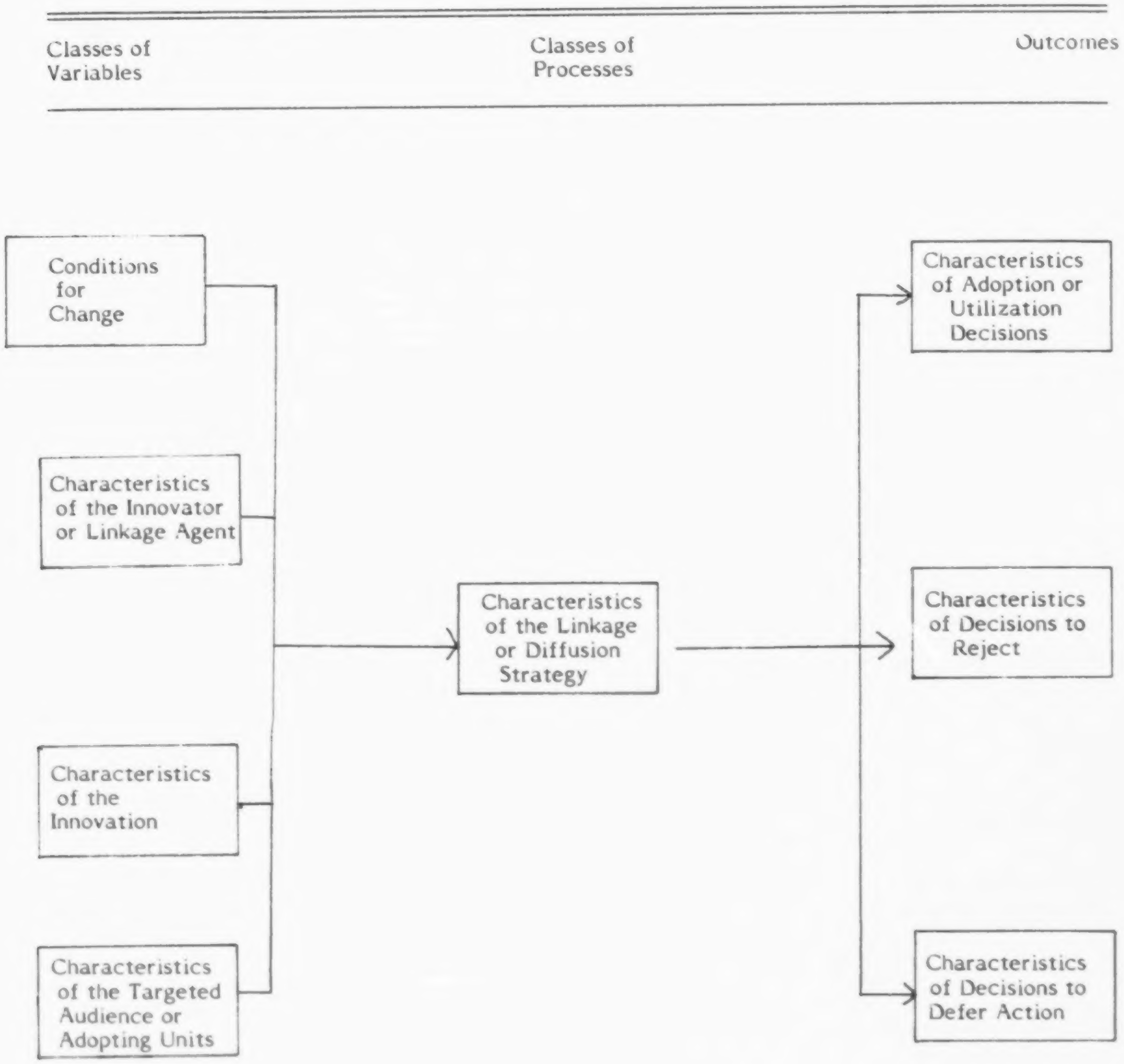
Classes of Variables
Classes of Processes
Outcomes
Conditions for Change
Characteristics of the Innovator or Linkage Agent
Characteristics of the Innovation
Characteristics of the Targeted Audience or Adopting Units
Characteristics of the Linkage or Diffusion Strategy
Characteristics of Adoption or Utilization Decisions
Characteristics of Decisions to Reject
Characteristics of Decisions to Defer Action

Figure 29-1. Classes of variables and processes related to knowledge diffusion/utilization phenomena.

diffusion/utilization studies by the author and his associates. These studies were focussed upon how to link the world of knowledge production with the needs of knowledge users. Work completed by Wolf, Fiorino, Hutchinson, Welsh, Allan, Goodman, and Thayer between 1973 and 1980 made clear: (a) specific variables and processes to be addressed; (b) a **modus operandi,** called metamethodology (See Metamethodology chapter this work), for addressing the variables and processes; and (c) how to apply outcomes of the enterprise. The remainder of this chapter addresses the third point; that is, how to apply outcomes of the enterprise.

PRACTICAL APPLICATIONS OF KNOWLEDGE DIFFUSION/UTILIZATION KNOW-HOW

Two instruments have been prepared for use by persons who assume responsibility for linking the world of knowledge production with the needs of knowledge users. The first instrument is called the Wolf-Welsh Linkage Methodology (WWLM), and the second is called the Wolf Knowledge Diffusion/Utilization Inventory (WKD/UI). Both were designed to meet the needs of persons responsible for linkage work.

WWLM. Preliminary work on the first tool was undertaken by William A. Welsh and the author about seven years ago. Welsh aspired to develop a "dissemination methodology" which would meet needs through the dissemination of products. He based his work upon the theoretical contributions of Thomas E. Hutchinson and W. C. Wolf, Jr., both of the University of Massachusetts at Amherst. Hutchinson designed a tool, called metamethodology, to build specific methodologies. Wolf set forth a conceptual framework for tackling practical problems of communication (See Figure 29-1).

Welsh's dissemination methodology was designed to be systematized, standardized, and operationalized. The term **"systematized"** indicates that there is a logical reason for the inclusion of each step in the methodology. The term **"standardized"** means that different persons using the methodology can apply the same set of rules and procedures. And the term **"operationalized"** means that the rules and procedures are stated with sufficient specificity to facilitate uniform comprehension.

The methodology consisted of ten primary steps and numerous sub-steps. Only a partial field test of the instrument was carried out, because funds earmarked for the work were cut back. Nevertheless, Welsh documented that the instrument: (a) anticipated and isolated potential linkage problems which he could address expeditiously; (b) was easy to utilize; (c) facilitated systematic evaluation work; and (d) facilitated replication, as each application of the instrument constituted a field test of it.

Subsequently, Allan (1977) and Goodman (1976) completed projects intended to expand and update the conceptual base of the methodology. Informal field tests of the tool were also completed by three doctoral students. These data identified a need to revise the instrument substantially. The author initiated the revision in 1978 and completed the work sixteen months later.

The revision was retitled the Wolf-Welsh Linkage Methodology. It consists of nine primary steps and numerous sub-steps. The primary steps (and the number of sub-steps) are:

I. Attributes of Persons Apt to Use the Linkage Methodology Effectively (six steps).
II. Identification of a Targeted Audience's Need to Modify some Aspect or Aspects of Professional Practice (five steps).
III. Identification of Practices and/or Products Apt to Meet Identified Target Audience's Needs (two steps).
IV. Selection of Practices and/or Products Apt to Meet Identified Target Audience's Needs (four steps).
V. Modification of Practices and/or Products Selected to Meet Identified Needs of Targeted Audience (three steps).
VI. Determination of Demographic Characteristics and Certain Attitudes (Toward the Plan to Modify Some Aspect or Aspects of Professional Practice) of the Targeted Audience (four steps).
VII. Conceptualization and Implementation of Strategies and Tactics Intended to Incorporate Designated Practices and/or Products Within the Professional Practice of the Targeted Audience (three steps).
VIII. Part One. Evaluation of the Modification in Practice (three steps).
Part Two. Evaluation of the Methodology (one step).
IX. Recommendations for Improving Upon Linkage Methodology (Steps I through VIII) on the Basis of Evaluation Results (Offered by Persons who Used the Methodology) (four steps).

Steps II, IV, and V pertain to **Conditions for Change;** Step I to **Characteristics of the Innovator or Linkage Agent;** Steps III, IV, and V to **Characteristics of the Innovation;** Steps II and VI to **Characteristics of the Targeted Audience or Adopting Unit;** Step VII to **Characteristics of the Linkage or Diffusion Strategy;** and Steps VIII and IX to the three outcomes mentioned.

This revision makes the nine steps more compatible with the theoretical framework upon which they rest; it incorporates a variable class (characteristics of the innovator) not addressed by Welsh initially; and it is a less prolix tool (even though the overall length of the tool has been reduced, the number of specific directions and examples have been increased).

Recently-completed informal field tests of the revised methodology conducted by three doctoral students revealed that the methodology: (a) met the needs of a director of a federally-supported project serving a local education agency; (b) met the needs of a person leading a municipal rezoning effort; and (c) met the needs of a state education agency official who employed the tool as part of an ex post facto study of proposals processed through his agency requesting federal research funds. A more formal field test of the instrument is currently under way in North Carolina in conjunction with a regional curriculum resource dissemination center of the Women's Educational Equity Act program.

Most recently, Thayer (1981) completed a comprehensive study of the WWLM, in which he surveyed, updated, and analyzed just the educational portion of the research-and-development work upon which the WWLM is based. He organized relevant studies identified under twenty-six generalizations which form the nucleus of the revised WWLM (three of these generalizations relate to conditions for change; five to the linkage agent; seven to the innovation; five to the targeted audience; four to the linkage modus operandi; and two to outcomes.) Thayer reported that the bulk of what exists within the educational archives isn't empirical in nature and doesn't effectively address many of the generalizations. He concluded that educational researchers' contributions to the twenty-six generalizations that support the WWLM have been mostly inconsequential. His work also raised questions about the applicability of the WWLM within educational contexts, given the modicum of viable educational research in existence to support or to challenge its utilization.

Further field tests of the WWLM are needed to establish its credibility. Steps are currently being taken by the author to obtain these data.

WKD/UI. Analysis of data, provided by persons who had made use of some or most of the steps of both versions of the linkage methodology, revealed a need for more systematic data acquisition. These persons described the kinds of data which were needed and indicated points in the sequence of steps at which these data would be useful. What the users sought was a more systematic approach to the acquisition of data (a) which was related to specific steps of the linkage methodology, and (b) which was related to decisions that linkers needed to make. Feedback provided by these persons was responsible for the evolution of a second instrument, called the Wolf Knowledge Diffusion/Utilization Inventory.

The theoretical configuration previously discussed (see Figure 29-1) provided a frame of reference for conceptualizing categories and items to be included within an inventory which would meet needs of linkage agents. Focal points of departure for conceptualizing items within this framework were (a) needs for data indicated in specific steps of the linkage methodology and (b) decisions that linkers needed to make during the communication process. Items were conceived, critiqued, field tested and revised five times until an inventory--consisting of five separate sections--emerged which seemed to fulfill the expectations held for it.

Part One of the WDK/UI focuses upon four "conditions" for change within targeted environments. **Part Two** highlights characteristics and commitments of the person(s) responsible for the linkage. **Part Three** emphasizes characteristics of the innovations(s) to be institutionalized. **Part Four** places emphasis upon characteristics of environments targeted for change. And **Part Five** focuses upon characteristics of selected communication strategies and tactics.

Each part of the instrument consists of four items. Up to four points can be earned for each item; hence, the range of scores possible is zero to eighty. Scores obtained can be related to four different aspirations set forth for the change enterprise. Average scores that are equal to or exceed the minimal average scores needed to fulfill the change aspirations suggest that the linkage plans are on target. Average scores that fall below the minimal average scores needed to fulfill the change aspirations suggest that the aspirations may not be realized. Below-average scores should alert the linkage personnel to re-examine the linkage plans they have made.

The WKD/UI has been designed to accompany the WWLM. The Inventory aspires to provide persons making use of the WWLM with decision-oriented data of importance to the linkage enterprise. These data can be used to reduce the guesswork associated with the linkage enterprise, they can be used to address whatever problems might arise, and they can be used to alter linkage plans **prior to** commitment of extensive resources. Persons using the Inventory have the added advantage of objective documentation to support some or many of their linkage decisions.

Further field tests of the WKD/UI are also needed in order to establish its credibility. Steps are currently being taken by the author to obtain these data.

IMPLICATIONS

The American Telephone and Telegraph Corporation has evolved a linear knowledge production-and-utilization system which effectively meets the needs of many people. The system includes: Bell Telephone Laboratories, a unit dedicated to invention and innovation; Western Electric, a unit responsible for the translation of new practices, products and ideas into forms that can be utilized within the AT&T system; and numerous regional telephone subsidiaries, units responsible for the delivery of varied communication services designed to meet needs of clients. AT&T's system is an example of the Research, Development and Diffusion model Havelock described earlier. The system not only works, but it works extremely well.

What works for "Ma Bell" may or may not meet the needs of a diverse social-science clientele. Definitive information on how best to meet the needs of these individuals certainly does not exist. Implications can be drawn from the previous pages to infer: that a linear model may be too restrictive for social-science researchers and practitioners; that the practitioners' need for knowledge varies too substantially to be met by any one particular approach; that knowledge production in the social sciences usually emerges as "ordinary knowledge," a form not apt to lead to clear-cut gains in practice; and that knowledge is a most erratic phenomenon.

Whereas the AT&T system's linear model is probably too prescriptive to accommodate these four inferences, the AT&T approach--rooted in a tradition of disciplined inquiry--ought not be ignored by researchers interested in bridging the knowledge production/knowledge utilization gap. Much relevant information already generated within rural and medical sociology illustrates what is possible in the social sciences through the disciplined use of inquiry methodologies. More of the same is needed.

This author offers linkage agents a frame of reference and two tools which facilitate disciplined inquiry. His "theoretical configuration" identifies salient classes of variables and processes of importance to the diffusion and utilization of knowledge. The configuration itself establishes a frame of reference for the disciplined inquiry.

The Wolf-Welsh Linkage Methodology translates the theoretical configuration into nine action-steps. The methodology is akin to a road map which specifies a starting point, alternate routes, and a destination. Persons who rely upon methodology aren't apt to lose sight of their aspirations or to make foolish decisions. Nor are they likely to fail, because the methodology is designed to ward off failure.

The Knowledge Diffusion/Utilization Inventory arms linkage agents with the kinds of data upon which rational decisions are made. Rational decision-making is the keystone of disciplined inquiry. The extra effort required to apply the Inventory is more than justified by the benefits accrued.

Linkage agents who use the configuration and the two tools are able to critically review their actions, make changes in their behavior as needed, and probably improve their effectiveness over time. Furthermore, the **modus operandi** of these linkage agents can be independently replicated without too much loss in precision. These are the elements of disciplined inquiry!

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APPENDIX I:
WOLF-WELSH LINKAGE METHODOLOGY

- I. **ATTRIBUTES OF PERSON APT TO USE THE LINKAGE METHODOLOGY EFFECTIVELY**
  - A. Prior experience of person.
    - 1. Person has successfully linked some aspect of knowledge production with some aspect of knowledge utilization within an institutional setting at least once, preferably twice.
    - 2. Person's professional background and demographic characteristics and the professional background and demographic characteristics of the typical member of a targeted audience are reasonably compatible.
  - B. Person is able to devote considerable time (hopefully, at least one day per week) to the linkage task.
  - C. Person can be counted upon to deliver promised services on time.
  - D. Person either has been trained to do some aspects of the following work or is **accustomed to contracting** with specialists for work desired:
    - 1. Assess needs of targeted audiences.
    - 2. Survey literature for various reasons, be able to retrieve pertinent material, and be able to meaningfully summarize results.
    - 3. Ascertain demographic characteristics and attitudes of targeted audiences.
    - 4. Conceptualize and then expedite diffusion/utilization strategies and tactics.
    - 5. Conceptualize and then expedite evaluation strategies and tactics.
    - 6. Prepare coherent project reports.
  - E. Person understands basic elements of individual and group motivation and is able to apply such know-how routinely.
  - F. Person listens well and communicates effectively.
- II. **IDENTIFICATION OF A TARGETED AUDIENCE'S NEED TO MODIFY SOME ASPECT OR ASPECTS OF PROFESSIONAL PRACTICE**
  - A. Define parameters of a targeted audience.
    - 1. Specify members of a targeted audience (i.e., all persons in two elementary schools, or special education personnel in a large city).
    - 2. Clarify roles of persons within the targeted audience (i.e., students, teachers, supervisors, administrators, etc.)
  - B. Ascertain needs of the targeted audience to modify practice, using modus operandi such as the following:
    - 1. Examine relevant materials (for example, local, state, and federal education-agency documents) for agency policy-shifts, expansion, or contraction.
    - 2. Conduct surveys of various members of the targeted audience (use a packaged needs-analysis methodology if applicable and if time permits).
    - 3. Compare practices of targeted audience with practices of other, similar groups.
    - 4. Examine available test results.
    - 5. Examine available demographic data (i.e., population trends) which pertain to the targeted audience.
  - C. List and prioritize needs of targeted audience.
    - 1. Prepare a list of the identified needs.
    - 2. Distribute the list to various members of the targeted audience for the purpose of determining their priorities (repeat as necessary until a clear picture of priorities unfolds).
    - 3. Use members' responses as a point of departure for establishing a prioritized list of needs.
  - D. Clarify who will participate in the final selection of the specific need or needs to be addressed (i.e., a committee, all involved persons, etc.)
  - E. Use the following criteria to facilitate selection of the specific need or needs to be addressed.
    - 1. Resources required to meet the need or needs.
    - 2. Time required to meet the need or needs.
    - 3. Positive and negative consequences of meeting the need or needs

4. Extent of target audience support/agreement.

NOTE: If the needs of a well-defined targeted audience have been ascertained, simply review what has been accomplished in light of the elements of Step II. Carry out only that work which has been overlooked or deleted from the initial effort.

III. IDENTIFICATION OF PRACTICES AND/OR PRODUCTS APT TO MEET IDENTIFIED TARGET AUDIENCE'S NEEDS

A. Determine existence of practices and/or products apt to meet need or needs.
   1. Search existing information repositories for desired know-how (i.e., ERIC, EPIE Institute, CEDaR Catalog, the PREP reports, etc.).
   2. Search catalogues of publishers and other vendors for desired know-how.
   3. Survey other groups which are like the targeted audience to find out what relevant practices and/or products are being used.
   4. Survey selected members of the targeted audience for desired know-how.
   5. Survey specialists for desired know-how.

B. Prepare a list of the available practices and/or products apt to meet the need or needs.

NOTE: If a specific practice and/or product is known which probably will meet the need or needs identified, and if further searching and surveying does not seem appropriate or necessary, work called for in Step III may be reduced or eliminated entirely.

IV. SELECTION OF PRACTICES AND/OR PRODUCTS APT TO MEET IDENTIFIED TARGET AUDIENCE'S NEEDS

A. Distribute the prepared list of practices and/or products to various members of the targeted audience for the purpose of determining their priorities (repeat as necessary until a clear picture of priorities unfolds).

B. Prioritize the list on the basis of responses received.

C. Clarify who will participate in the final selection of the practices and/or products.

D. Establish criteria such as the following, set forth conditions for acceptance/rejection, and then use the criteria to facilitate selection of the specific practices and/or products.
   1. Resources required to effectively utilize the practices and/or products.
   2. Time required to effectively implement the practices and/or products.
   3. Positive and negative consequences of implementing the practices and/or products.

NOTE: If a specific practice and/or product is known which probably will meet the need or needs identified, work called for in Step IV may be reduced or eliminated entirely.

V. MODIFICATION OF PRACTICES AND/OR PRODUCTS SELECTED TO MEET IDENTIFIED NEEDS OF TARGETED AUDIENCE

A. Ascertain (using some sort of survey procedure) the extent to which selected practices and/or products are compatible with generally-accepted professional practices of the target-audience members.
   1. Compatibility (i.e., updating science instructional-resources) is a positive indicator.
   2. Incompatibility (i.e., offering--for the first time--junior high school students an elective sex-education class) indicates further action must be contemplated.
      a. Review specifics of the selected practices and/or products for the purpose of isolating troublesome elements.
      b. Delete troublesome elements if possible.
      c. If troublesome elements cannot be deleted, reduce them to their least controversial form.
      d. Make plans to cope

with all aspects of adversity (related to the controversial elements) which can be anticipated.

B. Divide the selected practices and/or products into their most basic elements.

   1. Make plans to introduce the selections either piecemeal or in toto.
   2. Make plans to introduce the selections as a pilot undertaking or in toto.
   3. Prepare cost-estimates for implementing the various options suggested in Steps V.B.1. and V.B.2. above.

C. Expedite whatever additional adaptations of the selections that might seem appropriate for enhancing the probability of modifying the specified professional practices.

VI. DETERMINATION OF DEMOGRAPHIC CHARACTERISTICS AND CERTAIN ATTITUDES (TOWARD THE PLAN TO MODIFY SOME ASPECT OR ASPECTS OF PROFESSIONAL PRACTICE) OF THE TARGETED AUDIENCE

A. Survey members of the targeted audience to ascertain their prior history of professional self-renewal.

   1. Identify those persons (self-renewers) who routinely modify their professional practice.
   2. Identify those persons (entrenchers) who seldom modify their professional practice.

B. Use an uncomplicated sociometric survey technique (many options are available) to ascertain who are the "influentials" and who are the "isolates" within the targeted audience.

   1. Identify the influentials.
   2. Identify the isolates.

C. Interview a sample of the identified self-renewers and of the influentials to determine their respective attitudes toward the practice and/or products selected to meet specified needs of the targeted audience.

   1. Affirmation is a positive indicator.
   2. Either mixed reactions or opposition indicates further action must be contemplated.

      a. Review specifics of the interviews completed to isolate the sources of controversy.

      b. Eliminate controversial aspects of the implementation undertaking if possible.

      c. If controversial aspects cannot be eliminated, confront the sources of controversy and either overcome them or neutralize them.

      d. **Discontinue** the attempt to modify professional practice using the selected practices and/or products, if the controversy persists in force.

      e. If the **problem** continues to fester, go back to Step II and try again.

D. There is **no need** to invest either time or resources interacting with persons identified as entrenchers or isolates at this point in the implementation.

VII. CONCEPTUALIZATION AND IMPLEMENTATION OF STRATEGIES AND TACTICS INTENDED TO INCORPORATE DESIGNATED PRACTICES AND/OR PRODUCTS WITHIN THE PROFESSIONAL PRACTICE OF THE TARGETED AUDIENCE.

A. Conceptualize a strategy (with appropriate tactics) which meets five conditions:

   1. The strategy is geared primarily to the enterprise of persons identified as self-renewers and influentials, but it also involves all persons who will be influenced by modifications in practice.
   2. The strategy involves two steps: Step one focuses upon self-renewers and influentials; step two utilizes these persons to influence others to the targeted audience.
   3. The strategy makes maximum use of interpersonal (preferably face-to-face and two-way) channels of communication.
   4. The strategy is participative in that all persons who are to be affected by the modi-

fications in practice participate in making decisions about the undertaking.

5. The strategy incorporates a time-line which projects the realization of specified aspirations.

B. Offer the conceptualized strategy (with appropriate tactics) to selected persons identified as self-renewers and influentials for their critical review, and then modify it on the basis of feedback provided.

C. Implement the strategy (with appropriate tactics).

1. Expedite step one of the two-step plan.
    - a. Utilize varied interpersonal channels of communication to introduce the selected practices and/or products to the previously identified self-renewers and influentials.
    - b. Work closely with the self-renewers and influentials until a core of them have modified their professional practice as desired.
    - c. Recruit from the core of successful persons a small number willing to become involved in generalizing the modifications in practice to other persons within the targeted audience.
2. Expedite step two of the two-step plan.
    - a. Utilize varied interpersonal channels of communication to share desired modifications in the practice of the recruited self-renewers and influentials with other members of the targeted audience.
    - b. Work closely with the recruited self-renewers and influentials during their attempts to convince selected peers to modify practice as desired.
    - c. Continue the process of interaction until a substantial core of the targeted audience has modified professional practice as desired.

VIII. PART ONE. EVALUATION OF THE IMPACT OF THE DESIGNATED PRACTICES AND/OR PRODUCTS UPON THE PROFESSIONAL PRACTICE OF THE TARGETED AUDIENCE (EVALUATION OF THE MODIFICATION IN PRACTICE)

PART TWO. EVALUATION OF THE EFFICACY OF STEPS I THROUGH VII TO MEET NEEDS THROUGH THE MODIFICATION OF SOME ASPECTS OF THE PROFESSIONAL PRACTICE OF A TARGETED AUDIENCE (EVALUATION OF THE METHODOLOGY)

A. Conceptualize evaluation plans which meet six conditions.

1. The plans make provision for formative data acquisition at regular intervals throughout the implementation undertaking.
2. The plans make provision for summative data acquisition.
3. The plans can be expedited within the framework of available resources.
4. The plans make provision for the preparation of reports which can be understood by persons responsible for decision-making, and by persons being affected by the modification in practice.
5. The plans are set forth so clearly that a valid independent replication of them would be conceivable.
6. The plans take into account standard reliability and validity concerns associated with gathering, analyzing, and reporting consequences of data.

B. Offer the conceptualized evaluation plans to at least one evaluation specialist for her or his critical review, and then modify the plans on the basis of the feedback provided.

C. Highlight four consequences of the selected practices and/or products upon the professional practice of the targeted audience when expediting the revised plans:

1. The number of persons who could have and the number of persons who actually did modify their professional practice as desired.
    a. Characteristics of the set of persons who opted to modify their practice as desired.
    b. Characteristics of the set of persons who opted **not** to modify their practice.
    c. Similarities and differences between the two sets of persons.
2. Perspectives, derived from the "adopting" set of persons, pertaining to whether or not their needs were met.
3. Perspectives, derived from the "adopting" set of persons, pertaining to positive and negative effects of the implementations upon their professional practice.
4. Relationships between resource consumption and time allocation on the one hand and the utilization of desired practices and/or products on the other.

D. Highlight the extent to which Step I through VII of the linkage methodology met needs of a targeted audience when expediting the revised plans.
1. Perspectives, derived from the person or persons who used the tool, pertaining to the viability of Steps I through VII.
    a. Additional steps or sub-steps needed.
    b. Steps or sub-steps not needed.
2. Perspectives, derived from the person or persons who used the tool, pertaining to the precision of language contained in Steps I through VII.
3. Perspectives, derived from the person or persons who used the tool, pertaining to the precision of suggested activities contained in Steps I through VII.

IX. RECOMMENDATIONS FOR IMPROVING UPON THE LINKAGE METHODOLOGY (STEPS I THROUGH VII) ON THE BASIS OF EVALUATION RESULTS (OFFERED BY PERSONS WHO HAVE USED THE METHODOLOGY)

A. Set forth recommendations for increasing the precision of the language contained in Step I through Step VIII of the tool.

B. Set forth recommendations for increasing the precision of suggested actions contained in Step I through Step VII of the tool.

C. Set forth recommendations for adding steps or sub-steps to fill gaps recognized between Step I and Step VII of the tool.

D. Set forth recommendations for deleting steps or sub-steps deemed unnecessary between Step I and Step VIII of the tool.

APPENDIX II:

THE WOLF KNOWLEDGE DIFFUSION/UTILIZATION INVENTORY, FIFTH REVISION

ORIENTATION

The Wolf Knowledge Diffusion/Utilization Inventory (WKD/UI) has been designed to accompany the Wolf-Welsh Linkage Methodology (WWLM). The Inventory was designed to provide persons making use of the Methodology with decision-oriented data of importance to the linkage enterprise. These data can be used to reduce the guesswork associated with communication enterprises, they can be used to address problems which arise, and they can be used to alter communication plans **prior to** the commitment of extensive resources. Persons using the Inventory have the added advantage of having objective documentation to support some or many of their linkage decisions.

The Inventory consists of six separate sections, the first five of which consist of four items each. Up to four points can be earned for each item; hence, the range of scores possible is zero to 80. Scores obtained can be used to judge the viability of aspirations set forth for the change enterprise (see Part VI of the instrument).

Parts I through **V** are designed to be implemented sequentially. **Part I** and **Part II,** for example, are intended to be implemented first; **Part III** and **Part IV,** second; and **Part V,** last. Such a sequence can be varied by linkers to meet their

PART I. ASCERTAINING CONDITIONS FOR CHANGE WITHIN TARGETED ENVIRONMENTS.

Conditions for Change	Weight		Score
1. Number of new practices and products successfully adopted within or adapted to the targeted environment(s) over the past three years.	a. none	-0-	
	b. Two to four	-2-	
	c. More than four	-4-	______
2. Extent of dissatisfaction with current practice earmarked for change.	a. Little (fewer than 10% of persons affected are dissatisfied)	-0-	
	b. A moderate amount (ten to thirty percent)	-2-	
	c. Extensive (more than thirty percent)	-4-	______
3. Availability of current "needs" assessment information pertaining to change contemplated.	a. None available	-0-	
	b. Some available	-2-	
	c. Much available	-4-	______
4. Resource potential (i.e., risk money, facilities, flexible staff, etc., apt to be available) of environment to be changed.	a. None or limited	-0-	
	b. Moderate	-2-	
	c. Extensive	-4-	______

Total Score ______

respective needs. Data accumulated in this manner can then be related to **Part VI** to ascertain the viability of the linkage-agent's aspirations.

Part I focuses upon four "conditions" for change within targeted environments. **Part II** highlights characteristics and commitments of the person(s) responsible for the linkage. **Part III** emphasizes characteristics of the innovation(s) to be institutionalized. **Part IV** places emphasis upon characteristics of the environment targeted for change. And **Part V** focuses upon characteristics of selected communication strategies and tactics.

The data sought are relatively straightforward and obvious, with one exception. The person or persons responsible for the linkage enterprise must pass judgment upon their own characteristics and commitments when attending to **Part II**. There is a probable loss of precision as a residual of this self-appraisal.

The Wolf Knowledge Diffusion/Utilization Inventory is offered for examination and utilization by persons who assume varied communication responsibilities. It is not unreasonable to believe that the Inventory will serve these persons by increasing their effectiveness.

PART II. ASCERTAINING CHARACTERISTICS AND COMMITMENTS OF THE PERSON(S) RESPONSIBLE FOR LINKAGE.

	Characteristics and Commitments of Persons	Weight			Score
1.	Prior history of successfully linking some aspects of knowledge production with some aspects of knowledge utilization in an institutional setting.	a.	None	-0-	
		b.	Once or twice	-2-	
		c.	More than twice	-4-	
2.	Compatibility between characteristics and background of the linker(s) (i.e., training, experience, demographic characteristics, etc.) and the characteristics and background of a targeted audience.	a.	Little or no compatibility	-0-	
		b.	Some compatibility	-2-	
		c.	Much compatibility	-4-	
3.	Amount of time committed by linker(s) to expedite the change undertaking.	a.	Little (less than ten days total commitment)	-0-	
		b.	Moderate (more than ten days but less than one day per week throughout change undertaking)	-2-	
		c.	Extensive (at least one day per week throughout change undertaking)	-4-	
4.	Extent to which linker is capable of providing expertise (for example, needs assessment, evaluation, and diffusion know-how) likely to be needed throughout the change undertaking.	a.	Not capable	-0-	
		b.	Some capabilities	-2-	
		c.	Most capable	-4-	

Total Score

PART III. ASCERTAINING CHARACTERISTICS OF INNOVATION(S) TO BE INSTITUTIONALIZED.

	Characteristics of Innovation(s)	Weight			Score
1.	Extent to which information which establishes the worth of the proposed innovation(s) has been assembled.	a.	None assembled	-0-	
		b.	Some assembled	-2-	
		c.	Much assembled	-4-	______
2.	Problems apt to be associated with institutionalization of the proposed innovation.	a.	Many	-0-	
		b.	Some	-2-	
		c.	None anticipated	-4-	______
3.	Compatibility of the proposed innovation with existing practice.	a.	Marked departure	-0-	
		b.	Somewhat compatible	-2-	
		c.	Most compatible	-4-	______
4.	Extent to which the proposed innovation can be observed being utilized.	a.	Not visible	-0-	
		b.	Occasionally visible	-2-	
		c.	Routinely visible	-4-	______

Total Score

PART IV. ASCERTAINING CHARACTERISTICS OF ENVIRONMENTS TARGETED FOR CHANGE.

	Environmental Considerations		Weight		Score
1.	Number of persons in targeted environment to be affected by change.	a.	Many (more than 200)	-0-	
		b.	A moderate number (50 to 199)	-2-	
		c.	Few (less than 50)	-4-	______
2.	Number of opinion leaders and other influentials identified within targeted environment likely to support the proposed innovation.	a.	Few	-0-	
		b.	About half to two thirds	-2-	
		c.	Nearly all	-4-	______
3.	Number of decision-making levels (i.e., a school committee) in targeted environment.	a.	Many (more than four)	-0-	
		b.	A moderate number (three to four)	-2-	
		c.	Few (one or two)	-4-	______
4.	Number of administrative units (i.e., academic departments) to affected by change.	a.	Many (more than five)	-0-	
		b.	A moderate number (three to five)	-2-	
		c.	Few (one or two)	-4-	______

Total Score ______

PART V. ASCERTAINING CHARACTERISTICS OF SELECTED COMMUNICATION STRATEGIES AND TACTICS.

	Characteristics of Communication Plans	Weight			Score
1.	Number of persons significantly assigned to make and carry out communication plans.	a.	None	-0-	
		b.	One	-2-	
		c.	Two or more	-4-	____
2.	Complexity (in terms of "outside" money required, resources needed, consultants needed, etc.) of communication strategies and tactics planned.	a.	Most complex	-0-	
		b.	Somewhat complex	-2-	
		c.	Not complex	-4-	____
3.	Percentage of targeted audience likely to be reached as a direct outcome of the communication effort.	a.	Low (less than 15%)	-0-	
		b.	Moderate (16% to 50%)	-2-	
		c.	High (51% or more)	-4-	____
4.	Extent to which settled communication plans are likely to facilitate interpersonal communication among linker(s), opinion leaders, and other members of targeted audiences.	a.	Not likely	-0-	
		b.	Somewhat likely	-2-	
		c.	Most likely	-4-	____

Total Score ____

PART VI. ASCERTAINING RELATIONSHIPS BETWEEN COMMUNICATION INTENTIONS AND COMPLEXITY OF TASK.

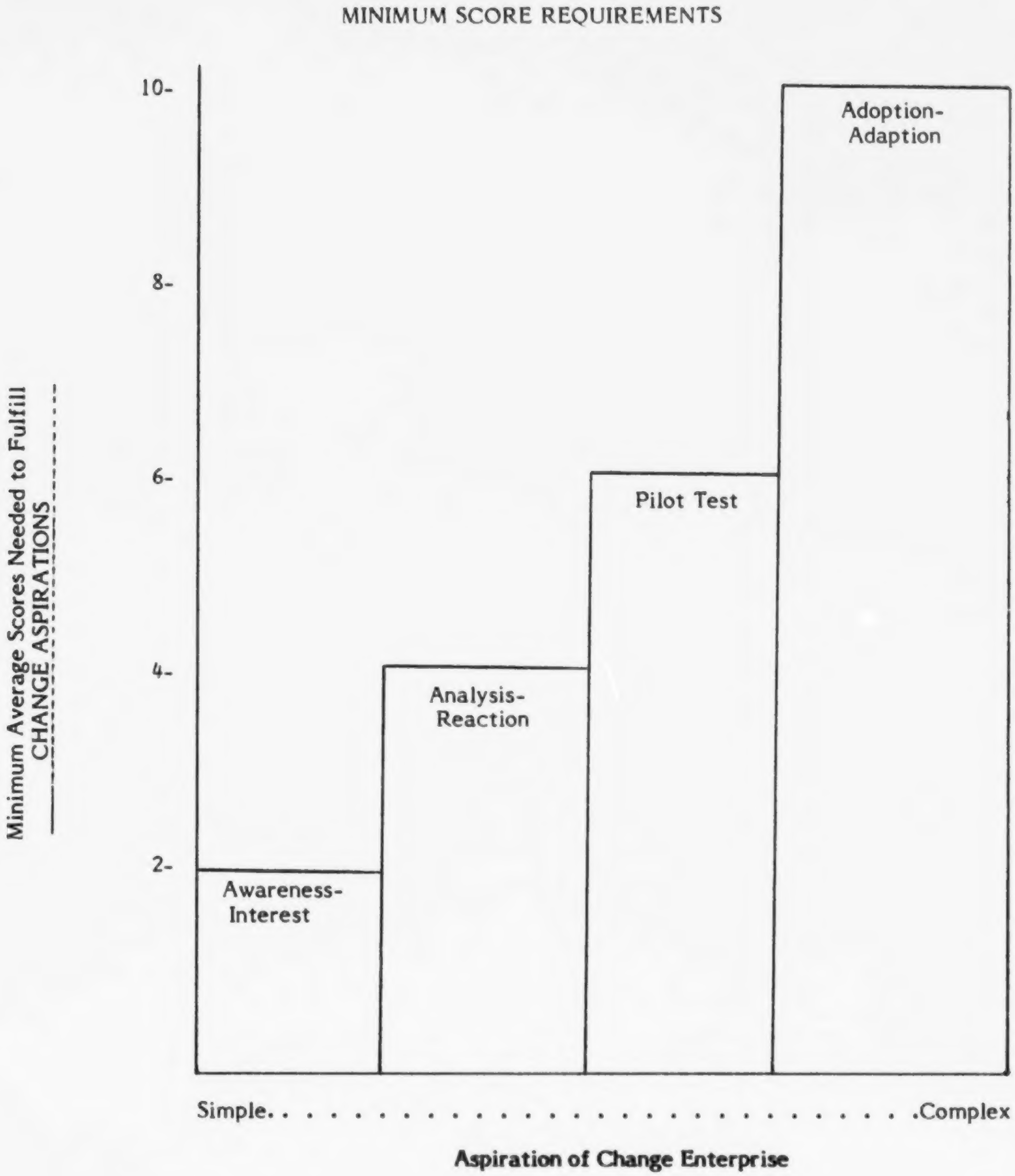
Add up scores recorded within each of the five parts of this instrument; pool the scores for all five parts; divide the resulting sum by five; then, compare the average score obtained with minimum scores needed (see page _) to fulfill each change aspiration.

COMPILATION OF RESULTS

Section	Score
Part I	_____
Part II	_____
Part III	_____
Part IV	_____
Part V	_____
Total Score	_____
Total Score ÷ 5	_____
Minimum Score Needed	_____
Difference	_____

Average scores that are equal to or exceed the minimal average scores needed to fulfill the change aspirations suggest that plans are on target. Average scores that fall below the minimal average scores needed to fulfill the change aspirations suggest that the aspirations may not be realized. Below-average scores should alert linkage personnel to re-examine their plans.

Figure 29-A.1. Minimum average scores needed to fulfill four different aspirations of the change enterprise are set forth in the following bar graph.



Chapter 30

Evaluating Instructional Development Projects: Guidance from the Literature on Change

Joseph J. Durzo
Barbara M. Florini

The premise of this chapter is simple. Instructional development implies planned change—a process of moving from the status quo to some new arrangement through the application of a systematic approach to the analysis of problems and the development of solutions. To the extent that examining process is important in evaluating programs, then understanding the change process accompanying instructional development efforts should be a focus for evaluators working in an instructional development context. Both formative and summative evaluations of instructional development efforts should include an analysis of the change efforts underlying instructional development. Consequently, evaluators should be familiar with basic information about change in order to effectively plan their investigations.

Given the above premise, this chapter presents a synthesis of the literature on planned change as a guide to evaluating the change process. In addition, key evaluation questions related to change issues are included throughout. The chapter concludes with a topical checklist for preparing an evaluation of an innovative instructional project. To accomplish these goals, the chapter is organized into the following sections:

PROCESS AS THE FOCUS OF EVALUATION
THE DIFFUSION OF INNOVATIONS
Individuals and Change
Evaluation Questions
PLANNED CHANGE
Some Classic Models of the Planned Change Process
The Distinction between Initiation and Implementation
Importance of the Distinction
Evaluating Implementation
Supporting Implementation
Evaluation Questions
RESISTANCE TO CHANGE
Other Sources of Resistance
Importance of Performance Gaps
Evaluation Questions
CHANGE AGENTS
Change Agent Roles
Internal or External Change Agents?
Similar or Different?
Client Contact
Evaluation Questions
TOPICAL CHECKLIST
Checklist

PROCESS AS THE FOCUS OF EVALUATION

By examining process as well as outcomes, evaluators can offer clients a more thorough assessment of the overall effects of projects. As pointed out by Morris and Fitz-Gibbon (1978), evaluations designed with process in mind provide information for eventual use in program planning and development by helping to identify what works in which settings. For example, process evaluation might reveal the critical importance of certain interpersonal relationships to the success or failure of a project.

Process evaluation is, in fact, already considered an integral component of many evaluation models. It is explicit in the CIPP model (Context, Input, Process, Product) proposed by Stufflebeam, et al. (1971), in which process is defined as "a particular and continuing activity subsuming many methods and involving a number of steps or operations." They describe three functions of process evaluation: (1) to detect or predict defects in the procedural design or in its implementation during implementation stages, (2) to provide information for decision-making, and (3) to maintain a record of the process.

Stake's "countenance" model of evaluation (1967) also recognizes the importance of evaluating more than outcomes. He suggests that evaluators pay attention to:

1. Antecedents: what existed before the project was implemented,
2. Transactions: what was done or what transpired, and
3. Outcomes: what resulted.

The "Transactions" component of the model may be thought of as being concerned with process. Stake describes transactions as including the "countless encounters of students with teacher, student with student, author with reader, parent with counselor--the succession of engagements which comprise the process of education." It is a small step to include the encounters between instructional developers and clients in this transaction category. Stake's continuing interest in process evaluation is reflected by his concern for a "responsive" evaluation, he proposes that evaluators be sensitive to the issues which arise from designing and operating projects, as these issues are identified through interactions with the participants in the projects.

Process evaluation is also important to the "illuminative evaluation" paradigm of Parlett and Dearden (1977). They suggest that evaluators study programs as a whole, including their rationale and evolution, operations, achievements and difficulties. Parlett and Dearden argue that the aim of illuminative evaluation is to study innovative programs--how they operate, how they are influenced by the setting, the significant features of the innovations and more. They insist that innovations should not be examined in isolation, but in the context in which they exist. In short, they make a persuasive case for evaluation of the process of developing and installing innovative projects as well as studying outcomes.

Given that the evaluation of process is important, what process issues should be examined in evaluating educational change efforts? Information about how people and organizations respond to change and the diffusion of innovations should point out some important process-oriented evaluation questions.

THE DIFFUSION OF INNOVATIONS

Much of the early research on innovation focused on the manner in which innovations spread or "diffused" to individuals and groups in a given geographic area such as across a town or throughout a country. This early work was primarily by rural sociologists who studied the agricultrual community, both in the United States and abroad. They were concerned with how individuals make the decision to adopt innovative farming practices and equipment once they become aware of its existence. An early result of such studies was a simple and very useful operational definition of what was meant by "innovation." Rogers and Shoemaker, in their landmark work Communication of Innovations (1971), describe an innovation as:

> an idea, practice or object perceived as new by any individual. It matters little, so far as human behavior is concerned, whether or not an idea is "objectively new" as measured by the lapse of time since its first use or discovery. It is the perceived or subjective newness of the idea for the individual that determines his reaction to it. If the idea seems new to the individual, it is an innovation.

In other words, the important issue is the perceived or subjective newness of the innovation. Simply because an idea, practice or program has been tried elsewhere doesn't mean that in a new setting it is no longer an innovation. In fact, if the idea **seems** new to people, they will react to it as an innovation. This is equally true whether people are reacting to change as individuals or as members of organizations.

Individuals and Change

In analyzing the diffusion of innovations, Rogers and Shoemaker (1971) studied the manner in which individuals make decisions to adopt or reject innovations. They concluded that individuals follow a four-step process in the adoption of innovations:

1. Knowledge: The individual is exposed to the innovation's existence and gains some understanding of how it functions.
2. Persuasion: The individual forms a favorable or unfavorable attitude toward the innovation.
3. Decision: The individual engages in activities which lead to a choice to adopt or reject the innovation.
4. Confirmation: The individual seeks reinforcement for the innovation-decision he has made, but may reverse his previous decision if exposed to conflicting

messages about the innovation.

Their model improved upon earlier efforts to describe the adoption process because it allowed for rejection decisions, as well as for adoption decisions. They also made provision for individuals who reverse their positions when they receive information which casts doubt on their original decisions.

In studying the individual adoption process, Rogers and Shoemaker found that the rate at which individuals adopt innovations varies. They described the degree of innovativeness as the degree to which individuals are relatively earlier in adopting new ideas than are other members of their social systems. Based upon the classification of the members of a social system with respect to degree of innovativeness, five categories of adopters were identified. At one end of the continuum are the **innovators,** who readily adopt innovations. They are followed by the **early adopters,** who are the next to adopt innovations. The **early majority** and the **late majority** follow the early adopters. All of these people preceed the **laggards,** who either adopt the innovation very late or never adopt it at all.

Rogers and Shoemaker report that "research has generally shown that the adoption of an innovation follows a normal, bell-shaped curve when plotted over time on a frequency basis." The figure below shows the normal frequency distribution of adopters, divided into five categories defined in terms of the mean and standard deviation (adapted from Rogers and Shoemaker).

It is helpful to know that in most social settings each of these categories will contain some people. However, this knowledge is even more important when combined with an understanding of three important roles individuals play in a change effort: **gatekeepers, opinion leaders,** and **formal leaders.** As the word implies, a gatekeeper is someone who is in a position to permit or deny access to people, information or resources. An opinion leader is a person whose opinion is well respected in the social system--the kind of person to whom others turn for advice and counsel. A formal leader is a person in a position of leadership--for example, the principal of a school or the manager of a department (Rogers and Shoemaker, 1971).

People in these roles can have a great deal of influence over innovative projects. For example, a gatekeeper who is a laggard (or resister to change) can exert an important negative influence by giving project-related tasks low priority or by denying access to information or people who are important to the project. An opinion leader who is an early adopter can be very persuasive in convincing other members of the organization to adopt an innovation. Formal leaders may not have the status of an opinion leader as well, but their formal authority should not be ignored, because they can use their formal power to block or support change.

Evaluation Questions

The understanding of various individual roles and characteristics is important for evaluators who are studying instructional development efforts, because it helps them to identify important issues. Durzo (1978) reported two key issues known to be important in assessing individuals' reactions to change: (1) the degree to which individuals are rewarded for participation in change efforts and (2) the degree to which individuals are willing participants--willing to innovate. The following questions provide a starting point for evaluators concerned with those issues:

1. To what degree were faculty members who participated rewarded for their efforts?
    - What is the reward-structure for faculty members who work on projects?
    - How do faculty members perceive the reward-structure?
    - Are there any negative results from being involved in the instructional development process?
    - What actually happens to participants in innovative projects? Do they stay at the institution? Get promoted? Receive tenure?
2. Were faculty members willing to innovate? Were faculty members initiative and was support provided?
    - Who initiated the change? Faculty members or administrators?
    - What activities were undertaken in the innovation decision-process to gain faculty support? What was done with respect to:
        knowledge: What was done to make people aware of the innovation?
        persuasion: What steps were taken to help individuals make up their minds about the innovation? Site visits? Research reports? Evaluation studies?
        decision: When was the decision made? What led to the decision to accept or reject the innovation? How was the decision made?
        confirmation: Were individuals reinforced or contradicted in their decisions by later information?
    - What was the general level of support among the faculty for the

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project?

- How were participants chosen? Were they volunteers or were they "drafted"?
- Who are the gatekeepers, opinion leaders and formal leaders in the organization? How did they feel about the project? What impact did they have upon it?

PLANNED CHANGE

A key point about the Rogers and Shoemaker model, and to some degree about the diffusion tradition as a whole, is that it focuses upon individuals. The Rogers and Shoemaker model has been criticized because it is primarily concerned with the adoption of simple innovations by individuals. Gross, Giacquinta and Bernstein (1971) argue that the individual-adoption model is ineffective as a tool for understanding innovation in educational settings, because most educational innovations are not easily implemented by individuals without the help (or at least the permission) of others. In addition, they suggest that many innovations are so complex that they cannot simply be tried out in a neat, either/or fashion, and may require several years of observation before adequate judgments can be made about their suitability for permanent adoption.

In a later work with another author, Rogers took up the study of innovation in organizations (Rogers and Rogers, 1976) and found that the innovation process must be preceded by a problem-definition stage. Presumably the innovation developed or selected would then be one which would help the organization to solve its problems. This new focus upon matching the needs of the organization with the innovation represents a bridge from the sociologists' study of how individuals decide about innovation to a parallel study of planned change in organizations.

In 1958, Lippit, Watson and Westley, in their landmark work, The Dynamics of Planned Change, defined planned change as:

> change which derives from a purposeful decision to effect improvements in a personality system or social system and which is achieved with the help of professional guidance.

Later, Bennis described planned change as a linkage between theory and practice or between knowledge and action. He explained that planned change involves "a change agent, a client system, and the collaborative attempt to apply valid knowledge to the client's problem" (1969). Using this framework, instructional development may be viewed as a specific type of planned-change effort in which an instructional developer functions as a change agent to help a client apply knowledge about learning, instruction and educational technology to the solving of educational problems. Evaluation of instructional development, then, may be thought of as evaluating a specific type of planned-change effort.

Evaluating planned change may be made easier by having "conceptual handles" with which to grasp what might otherwise be very elusive issues. In other words, understanding something about planned change should make it possible to identify key evaluation questions more readily. An overview of several classic models of the change process is a good place to start. It is important, however, to point out that reducing the change process to numbered steps on a printed page tends to make the process seem very simple and rational. At best, models are only abstract reductions of very complex organizational events. However, familiarity with several models of the change process will provide evaluators with a starting place from which to begin their investigations of planned change and innovation efforts.

Some Classic Models of the Planned Change Process

In 1958 Lewin outlined a simple three-stage model of the change process which is the basis for many later change models:

1. unfreezing
2. moving
3. re-freezing

By "unfreezing" Lewin means breaking those existing social habits or customs which are the basis of an "inner resistance" to change in any given situation. This is a keystone idea in the planned-change literature. If the social requirements of a new situation are not congruent with those of the old one, some additional energy must be directed at changing the old customs so that they do not act as a barrier to a desired change. For example, if an organizational change requires teachers to alter their traditional teaching methods, they might resist the change because of their preference for the existing methods. To get the teachers to change, it would be necessary to "unfreeze" their existing habits and social norms. It is important, therefore, to analyze the norms, habits, customs and other sources of resistance among the target-group members so that energy may be directed at unfreezing them.

"Moving" refers to a change from the old situation to the new one. In the case of the teachers, instituting the new organizational pattern and the required changes in teaching method would entail moving them from the status quo to the desired state of affairs. If sufficient energy was directed at wining their endorsement of the change, appropriate steps could then be taken to "re-freeze" their new social habits to conform with the requirements of the innovation.

Burke, in an interview which appeared in Group and Organization Studies (1980) asserted that even today, after much elaboration on this simple model, change agents would not go far wrong if they simply remembered these three phases. Nonetheless, examining several more-detailed models will provide additional points of entry for process evaluation. For example, Lippit, Watson and Westley (1958) developed a list of seven phases of a change process:

1. Development of a need for change.
2. Establishment of a change relationship (between the client and a change agent).
3. Clarification or diagnosis of the client system's problem.
4. Examination of alternative routes and goals; establishing goals and intentions of action.
5. Transformation of intentions into actual change.
6. Generalization and stabilization of change.
7. Achievement of a terminal relationship.

More recently, Havelock's model (1973) provides a similar list of stages of the change process:

1. Building a relationship (between change agent and client).
2. Diagnosing the problem
3. Acquiring relevant resources.
4. Choosing the solution.
5. Gaining acceptance.
6. Stabilizing the innovation and generating self-renewal.

An important point about these models is that they both start with a definition of the problem, move through an analysis phase, and go on to an action phase. This is followed by some sort of activity designed to terminate the relationship between the client and the change agent.

The Distinction Between Initiation and Implementation

An important distinction made by Zaltman, Duncan and Holbek (1973) is that the change process in organizations may profitably be thought of as occurring in two major phases--the initiation phase and the implementation phase.

Stage I—Initiation Stage

1. Knowledge-awareness substage
2. Formation of attitudes toward innovation substage
3. Decision substage

Stage II—Implementation Stage

1. Initial implementation substage
2. Continued-sustained implementation substage

Briefly, Zaltman et al. argue that at the Initiation Stage the organization goes through those activities which are necessary in order to make a decision about whether or not to adopt and implement the change. For example, during this stage members of an organization become aware of an innovation and of its significance. Based upon what they know about their problems and about the innovation, they form attitudes about its potential utility, and then decide whether or not to adopt it. Only then does the organization move to Stage II, in which implementation is considered. In Stage II the organization puts the innovation into place in a pilot or test version, and if it succeeds, it moves on to some sort of full implementation or a continued or sustained basis.

The idea of initiation and implementation stages has other support in the change literature. Berman, Greenwood, McLaughlin and Pincus (1975) also distinguish between initiation and implementation in their analysis of federally-supported change efforts in the public schools. They describe a three-stage model of change, which represents an elaboration upon the work of Zaltman et al. by giving separate consideration to initial and continued implementation:

1. Initiation: the period when a project is conceived and support is sought for it.
2. Implementation: the stage when a project confronts the reality of the organizational setting; and
3. Incorporation: the final stage when a project moves from experimental status and becomes a part of the daily environment of the institution.

Importance of the Distinction

The separation of the change process into initiation and implementation phases is important for evaluating instructional development because it provides an approach for considering the tactics used in accomplishing change. Unless the strategies chosen match the stage of the process, they may not achieve the desired results. For example, a workshop illuminating the mathematics problems of freshman students may be an excellent strategy for convincing college faculty members that a problem exists and for preparing them for the need to change (initiation). Such a workshop would, however, be ineffective as an implementation strategy intended to help them devise ways of developing and pilot-testing potential solutions. Evaluators, then, should be concerned about determining what types of activities were undertaken for each stage of the project.

Evaluating Implementation

During the implementation stage a wide variety of activities can take place which might alter the faithfulness with which the original idea or innovation is implemented. Berman et al. (1975) describe three things which could happen in a school system during the implementation stage of externally developed innovations:

1. **Mutual adaptation.** Both the project design and the institutional setting are changed;
2. **Non-implementation.** Neither element is changed, usually because of institutional indifference or lack of ability;

3. **Co-optation.** The institution changes the project (usually emasculating it) to meet its needs, without any corresponding change in the institution.

Hall and Loucks (1977) go further in guiding the evaluation of implementation by describing eight levels of use of innovations.

Nonuse:	The user knows little or nothing about the innovation, has no involvement with it and is doing nothing about becoming involved.
Orientations:	The user has recently acquired information about the innovation.
Preparation	The user is preparing for the first use of the innovation.
Mechanical Use:	The user is focusing effort upon the day-to-day use of the innovation and is trying to master the tasks required for use, often resulting in superficial use. Changes being made are for user needs rather than client needs.
Routine:	The use of the innovation is stabilized with few, if any, changes being made in ongoing use and little thought being given to modifications.
Refinement:	The user varies the use of the innovation based upon knowledge of short- and long-term effects upon clients.
Integrations:	The user combines the use of the innovation with efforts of colleagues in order to achieve collective impact.
Renewal:	The user re-evaluates the quality of the use of the innovation, seeks major modifications or alternatives, explores new developments and alternative goals for self and system.

Supporting Implementation

What, then, are the attributes of projects which have successful implementation records? Summarizing the results of a large study of educational innovations in the public schools conducted by the Rand Corporation, Greenwood, Mann and McLaughlin (1975) report that projects having the fewest implementation problems have the following characteristics:

1. strong training components (for users to teach them about the innovation),
2. practical "how to do it" workshops,
3. local expertise and technical assistance,
4. frequent, regular staff meetings,
5. local materials development,
6. voluntary, highly-motivated participants,
7. an elementary school focus, and
8. a "critical mass" of project participants.

They also observe that the following attributes of the institutional setting influence the implementation of projects:

1. administrative support and commitment,
2. past experience with the particular innovation,
3. high propensity to innovate,
4. administrative flexibility, and
5. good communications.

Evaluation Questions

The change process is complex and fraught with difficulty and uncertainty for those involved in academic re-design. Successful completion of planned change efforts requires (1) assistance in implementation and initiation stages, (2) time to work on the project, (3) an understanding of the proposed innovation by participants, (4) a supportive climate, (5) appropriate resources--time, money, people, and (6) the ability to adapt the innovation to the institution and vice-versa. Evaluation efforts should attempt to determine the existence and impact of such implementation support. It is important to know what was done during the implementation stage and how it affected the outcomes of the effort. The following questions are a starting-point for that inquiry:

1. Was assistance provided in both the implementation and initiation stages of the change process?
   -- What initiation activities were there? What kind of support was available during this phase? For example:
      Were site visits made to similar projects?
      Were consultants brought in to help plan the project?
   -- Is the innovation being used as planned?
   -- Is the innovation being used evenly by all members of the organization? Which members are using it as planned?
   -- What kinds of adaptations were made in the innovation or in the organization during implementation?
   -- What types of activities were undertaken to support implementation? What was done to facilitate implementation?
   -- Were the activities chosen for each stage well-matched to accomplish the goals of each stage? In other words, were implementation-type strategies

used at the implementation stage?

2. How was time provided to faculty members to allow them to participate in the project?
   - Were faculty members given released time during the academic year or paid for summer work? Both? Neither?
   - Were project time lines realistic for accomplishing intended outcomes? Who set the time lines?
3. Did faculty members understand the proposed innovation well? Were they provided the opportunity to learn about it?
   - How did faculty members learn to use the innovation? Formal training? Informal training? Peer communication? Independent work?
   - Did lack of knowledge restrict the eventual level of use of the innovation or modifications made during use?
4. Was the institutional climate supportive? Did the president and other high-level administrators support it?
   - What was the nature of administrative support?
   - What is the history of the institution with respect to supporting change?
   - Is good teaching important? How is it recognized?
5. Were appropriate resources for innovations made available by the institution?
   - What was (were) the funding source(s) for the project? Institutional "hard" money? External "soft" funds? Federal? State? Private foundation?
   - What restrictions were there on the use of funds? How much flexibility did project adminsitrators have?
   - Who controlled resources? How were allocation decisions made?
   - Were adequate resources available to get the job done?
   - If resources were not adequate, what problems were created by the lack of resources? What modifications were made as a result?
6. Was there mutual adaptation between the innovation? Was the innovation consistent with institutional norms?
   - What kind of adaptations were made in the innovation? Was it changed in important ways?
   - What kinds of adaptations were made in the organization or in people's behaviors in order to adopt the innovation? For example:
     Were faculty teaching loads altered?
     Were administrative policies or procedures changed?

RESISTANCE TO CHANGE

Talk with any group of instructional developers or others who work at bringing about change in education and you will hear a great deal about the difficulty of initiating change. The most common questions seem to be: How do you get faculty members to change? How do you overcome their resistance?

Zaltman, Florio and Sikorski (1977) made an interesting point about resistance to change in education. They observed that educators are often criticized for being among the most conservative groups when faced with proposed changes. They argue, however, that educators probably have more legitimate reasons for resisting changes than do other professionals, because few other groups have had so many innovations presented to them with so little evidence supporting their effectiveness.

Zaltman and Duncan (1977) point out that resistance can be a healthy, positive force that, in some instances, is quite justifiable. Resistance can also cause proposed changes to be made more compatible with the overall system into which they are being introduced. By addressing resistance in a constructive manner, it is possible to acquire additional information about the conditions, processes and relationships within an organization. Creative responses to resistance by instructional developers can both inform and enhance their contributions, especially during the formative stages of a project.

Seen in this context, it is possible to view resistance to change as a normal, healthy, constructive reaction. In fact, some changes are not creative, useful or practical and do not represent improvements over the status quo. Change agents should be careful to first explore, then, if appropriate, reduce this resistance through continued deliberation. In many instances, the gathering and intelligent use of data (needs-assessment data, product-evaluation data, post-course evaluation data, etc.) can provide a basis for acceptance of change.

Other Sources of Resistance

There is another side to the question of resistance. As Sarason (1971), Zaltman and Duncan (1977) and others point out, resistance to change may also be caused by the cultural values or beliefs of the target group or by their suspicion about the applicability of the proposed change. Whatever the cause, change agents are advised to move carefully when dealing with these sources of resistance, because the chances of successfully implementing a change are low if they are ignored. In a summary of factors to be taken into consideration in studying resistance, Watson (1967) describes four major areas of concern:

1. Who brings the change?
2. What kind of change is it?
3. What procedures are used to institute the change?
4. In what kind of climate is the change proposed?

In a review of the literature about resistance to change, Zaltman et al. (1977) discuss five major sources of resistance:

1. cultural barriers
2. social barriers
3. organizational barriers
4. psychological barriers
5. attributes of the innovation

Similarly, Sikes, Schlesinger and Seashore (1974) report eight sources of resistance to change:

1. difficulty of demonstrating the value of the change
2. difficulty of the role of the change agent
3. parochialism
4. the ambiguous role of adminsitrators
5. lack of change-oriented concepts and skills by those involved
6. change-oriented personnel who are not in the mainstream of the organization
7. policies and practices of the organization which discourage change
8. difficulty of maintaining volunteer-based change-efforts.

Use of any of these models can facilitate the identification of sources and causes of resistance. This is a necessary step, but it is not sufficient by itself to overcome resistance. Resistance may stem from the fact that the target group sees no need for the change. Consequently, beginning with some identification of need is important, as was pointed out earlier in the discussion of change-models. In the change literature this is referred to as the identification of "performance gaps." Performance gaps refer to evidence of a discrepancy between the status quo and some desired state.

Importance of Performance Gaps

Resistance to change is natural unless the change has perceived value to the client group. It seems almost too simple to say that unless decision-makers and other key individuals see the need to change, the likelihood of change occurring is low, but this fact is often ignored. Durzo (1978) reports considerable evidence that serious change-efforts should begin with an attempt at problem analysis. Eraut (1975) argues that planned change should be defined as change undertaken in response to perceived problems.

Rogers and Rogers (1976) describe the identification of performance gaps as necessary before any innovation-process can take place. Zaltman et al. (1977) also stress the importance of identifying performance gaps in order to initiate the change-process. They conclude that performance gaps provide the major force for change in education. Lindquist (1978) also supports the importance of attention to performance gaps in his analysis of what is required to create change in higher education. He argues that unless organizational members, leaders or external supporters perceive a wide gap between what they think the organization is doing and what they feel it ought to be doing, they are not likely to bother with an effort to make a change. He does caution, however, that, unlike financial performance gaps, educational performance gaps are sometimes very difficult to perceive.

Lindquist's point is well taken. In higher education, where individual faculty members have authority and control over course content, it matters little that an instructional developer perceives a performance gap. What is important is that the people with the power to authorize and support a change-effort perceive the gap and believe it is important to close it. Simply demonstrating a performance gap will not automatically result in a major change-effort. However, it is unlikely that serious change will be attempted in the absence of an important performance gap perceived by the key decision makers and opinion-leaders of an organization.

Evaluation Questions

It would be overly optimistic to suggest that there is a simple way in which resistance to change could be analyzed in evaluating an instructional development project. There are simply too many factors involved for such an analysis to be a simple process. However, there are several key issues which emerge from the literature as important starting-points for evaluation: (1) Change-efforts should begin with a problem-solving stage. (2) Perceived need is established by the identification of performance gaps. (3) Proposed innovations should have a perceived advantage over present practice. (4) Pilot-tests and demonstrations are useful in establishing the utility of the innovation.

1. Did the instructional development effort begin with needs-assessment and problem-solving?
    -- Was a needs-assessment done?
    -- Who requested the needs-assessment?
    -- Were the results of the needs-assessment believable to the faculty (or other clients)? To administrators?
2. Were there evident performance gaps or other pressures for change?
    -- What perceived need was the project intended to meet?
    -- Who perceived the need? What was the level of agreement about the existence of the need?
    -- How important was it that the performance gap be closed? How much consensus was there about this? What groups or individuals

did not agree?

3. Did the proposed innovation have any advantage over present practice? Did it produce tangible results in a workable fashion?
    - What advantages (benefits) does the innovative solution have over present practice?
    - How was the innovation presented or "sold"? What benefits were the key selling-points?
    - Did the innovation live up to its promises?
    - Was the innovation perceived as a means of closing some important performance gap?
4. Was the innovation pilot-tested or given an experimental demonstration or trial?
    - Was a pilot-test conducted?
    - If no pilot-test was doen, what were the reasons for not doing one? Was this a problem for the project later?
    - What decisions were made as a result of the pilot-test?
    - What modifications were made as result of the pilot-test?

CHANGE AGENTS

Up to this point the chapter has focused upon individuals and groups, upon how they react to change and innovation, and upon the change-process itself. Another key element in the evaluation of innovative projects is a consideration of the people in the system who are working to produce change--change agents. Rogers (1972) described a change agent as "a professional who influences innovation decisions in a direction deemed desirable by a change agency." Instructional developers may be thought of as change agents, and similarly, instructional development clients themselves are also change agents in their own right, since they are designing innovations to be implemented within their own organizations. Consequently, understanding the roles played by change agents will be useful in evaluating instructional development projects.

Change Agent Roles

Havelock (1973) describes four primary change-agent roles:

1. **Catalyst:** to energize the change process and get things started.
2. **Solution-Giver:** to offer solutions and help clients adapt them to their situations.
3. **Process-Helper:** to assist clients in solving their own problems by helping them work through the problem-solving process.
4. **Resource-Linker:** to help clients find and make the best use of resources.

Of course, these four roles are not mutually exclusive. Change agents may play any or all of these roles in a single planned-change effort. Rogers and Shoemaker (1971) outline seven tasks which may be undertaken by change agents while assisting clients:

1. **Develops need for change:** The change agent is often initially required to help clients become aware of the need to change.
2. **Establishes a change relationship:** A change agent must establish rapport with his clients, since they must accept the change agent before they will accept his changes.
3. **Diagnoses the problem:** The change agent is responsible for analyzing the client's problem situation to determine why the existing alternatives are not working.
4. **Creates intent to change in the client:** The change agent's role here is to motivate his clients to pursue some change strategy.
5. **Translates intent into action:** The change agent works to achieve compliance with the suggested change and to be sure that action is taken.
6. **Stabilizes change and prevents discontinuances:** Here the change agent must positively reinforce those who undertook the change--usually in the trial-adoption stage.
7. **Terminates the relationship:** Since the end goal for a change agent should be the development of self-renewal capabilities for his clients, he should develop his clients' abilities and thereby lessen their need to rely upon him.

Internal or External Change Agents?

In addition to understanding the roles and tasks of the change agent, it is also helpful to examine the relationship of the change agent to the client group. One important factor in the relationship may be whether the change agent comes from within the system or from outside it. Havelock (1973) discusses the advantages and disadvantages of being a change agent from within the system--an "internal change-agent," and from outside the system--an "external change-agent." He believes that the internal change-agent has the following advantages and disadvantages:

Advantages

1. knows the system.
2. speaks the language.
3. understands the norms.
4. identifies with the system's needs and aspirations.
5. is a familiar figure.

Disadvantages

1. may lack perspective.
2. may not have the special skill relevant to the innovation.
3. may not have an adequate power-base.
4. may have to live down past failures.
5. may not have independence of movement, which will limit role.

Similarly, he describes the advantages and disadvantages of the external change-agent role:

Advantages

1. starts fresh and is not burdened by negative stereotypes.
2. is in a position to have perspective.
3. is independent of the power-structure.
4. is in a position to bring in something genuinely new.

Disadvantages

1. is a stranger.
2. may lack the knowledge of the insider about the system's norms, values and aspirations.
3. may not care enough.

It appears, then, that the two roles each have significant advantages and disadvantages. In most organizations, change is accomplished by some combination of people playing inside and outside roles. In many instances, change-teams include an outsider and an insider working together. This provides the benefits of both internal and external change-agents, while helping to minimize the disadvantages of each. Often, however, in large organizations, one person can be both an internal and an external agent, depending upon the perspective from which the person is viewed. On a college campus, for example, an instructional developer from an ID agency would be an inside change-agent with respect to the institution as a whole, but an external change-agent with respect to individual academic departments. Consequently, the developer would bring many of the advantages of both inside and outside change-agents to a project, but would also bring some of the disadvantages of each.

Similar or Different?

Another important variable in the change-agent relationship is the degree to which the change agent is similar to or different from the client group. Change agents who are similar to clients are those who share the general values, attitudes and beliefs of the client group. The more divergent these views become from the client, the more the change agent is perceived as "different." In a public school, for example, an instructional developer who was formerly a teacher in the system would have a greater similarity to the client group than would a person who had worked only in industry.

Zaltman and Duncan (1977) see each as having advantages and disadvantages which vary with different task-categories. For instance, when the client relationship is being established, they believe that the primary advantage of the change agent who is different from the client lies in a greater likelihood of being readily accepted as an "expert" who knows things the client does not know. They feel that this might encourage clients to be more open and to share their expectations regarding the change. On the other hand, during the stage when the situation is being diagnosed, the agent who is similar may have the advantage of being able to communicate more accurately and effectively with the clients because they share so many points of contact.

Because of this communication ability, the advantages of the "similar" change agent also include being able to interact effectively with the client system along various dimensions, such as dealing with resistance and maintianing change. According to Zaltman and Duncan a "different" change agent can overcome some of the disadvantages of not sharing the values, attitudes and beliefs of the client system by being emphathetic. They caution, however, that empathy should not be allowed to overshadow expertise, because it is often necessary to have a change agent who has a perspective which is significantly different from that of the client.

A succinct summary of the nature of change agents and their relationships with clients is provided by Rogers and Shoemaker (1971), who conclude that a change agent's success is positively related to the following factors:

1. the extent of the change effort.
2. the agent's client-orientation rather than change-agency orientation.
3. the agent's empathy with clients.
4. the extent to which the agent works through opinion leaders, and
5. the agent's credibility in the eyes of the clients.

Client Contact

The list provided by Rogers and Shoemaker also serves to amplify the difficulty that change agents face in trying to find ways to work successfully with various clients. Outsiders must find ways to make insiders feel comfortable with their presence in the organization, and inside change-agents must overcome the handicaps of the role before being able to utilize its advantages. Similarly, change agents who are unlike the clients must overcome the natural suspicion that "they don't really understand our problems." However, change agents who are like the clients must overcome the handicap of having similar assumptions and training, which may act as blinders to new solutions.

To play the change-agent role properly requires competence in working with groups and in handling difficult situations with clients who may be suspicious, hostile or disinterested. Burke, (1980), in his interview with John Jones, stresses the importance of having adequate training in group-process skills in order to be well-prepared to assist clients in implementing change. Similarly, Bratton (1979-80), Coscarelli and Stonewater (1979-80), in a recent issue of the Journal of Instructional Development, all call for instructional developers to have increased training for the change-agent role. They describe the need for developers to have optimum "client-contact skills" in order to accomplish instructional development.

Havelock (1973), Schein (1969), and Davies (1975) all discuss the importance of the early stages of the relationship between the client and the change agent. They emphasize the need to begin the relationship on a trusting, positive note, with the roles and expectations of both clients and change agents clearly specified in order to maximize the possibility of success. In addition, Sarason (1971) urges change agents to tailor their efforts carefully to each individual situation so that the individual differences found in each setting are taken into consideration.

The final stages of the change process are also worthy of special mention. Lippit, et al. (1958), Havelock (1973), Davies (1975) and Schein (1969) have all written about the difficulties inherent in terminating the relationship between the change agent and the client as a project nears completion. The termination of the relationship is often as difficult and as crucial as is beginning the early phases of a relationship.

"People skills" are important to the change process and should not be overlooked during evaluation efforts. In many instances a project will succeed or fail in achieving its goals in large part because of the change-agent's skill at helping people through the change process. Successful change efforts require personal contact between the change agent and the client group. Havelock (1973) and House (1974) emphasize the importance of the change agent making personal contacts with formal leaders, opinion leaders, potential resisters and other key people in order to adequately carry out a planned change-effort. One advantage of personal contact is that it gives the change agent feedback on the reactions of members of the organization to the change process. In addition, contact with the change agent "forces" the person contacted to think about the project in a concentrated and serious manner.

Personal contact also allows the clients to express their fears, doubts, and expectations of difficulty to the change agent. Havelock feels that personal contact is most vital at the time when the client is about to try the innovation (the implementation stage). Experience in instructional development projects supports the importance of being available in person to help clients solve the problems which arise during the implementation of a newly-designed course. However, there is no research to support the conclusion that personal contact at this stage is any more important than at the early stages of the project. In fact, it is difficult to imagine just how an outside agent would establish the trust and confidence levels necessary without personal contact.

Evaluation Questions

Because the change agent-client relationship can be crucial for the success of a project, it should be examined as a part of the process of evaluating an instructional development project. The following ideas emerge from the literature as important: (1) An organization or individual should be available to support change efforts. (2) The role of the change agent and the nature of the relationship between the change agent and client group are important factors in the success (or failure) of any change effort. The following questions provide a beginning point from which to analyze the support-network for the project:

1. Was there an organization or structure to advocate and support change? Was assistance available?
   -- Was there an instructional development agency, program, committee or office involved with the project?
      If such a support group exists and was not involved, what are the reasons?
   -- What was the nature of the informal support-network for the project?
   -- Was a support agency or program involved in generating the project?
   -- How do participants feel about the level of support within the institution?
2. Who played the role of change agent?
   -- Who were the change agents? Were they volunteers or were they "drafted"?
   -- What roles did the change agents play? Catalysts? Solution-givers? Process-helpers? Resource-linkers?
   -- What kinds of activities did the change agents use to:
      develop the need for change
      establish change relationships
      diagnose the problem
      create intent to change
      translate intent into action
      stabilize change
      end the relationship
   -- Was the change agent internal or

external to the system? Did this cause problems? What were they?

-- Was there a team of change agents (internal/external)?

3. What was the nature of the relationship between the change agent(s) and the client?

-- Was the change agent "similar" to the client-group or "different"?

-- How well did the change agent work with the clients? How good were the change agent's client-contact skills?

-- How much personal contact was there between the change agent and the clients? What form did the contact take?

-- How did the change agent terminate the relationship with the clients? Was the client satisfied?

-- How self-sufficient are the clients at maintaining the innovation and managing new change without the help of the change agent?

-- What are the client's attitudes toward the change agent?

TOPICAL CHECKLIST

The evaluation of innovative projects in education is not simple. However, systematic application of what is known about change and innovation in education should provide evaluators with a useful approach to the exploration of issues important to the evaluation of innovation. The questions raised for consideration throughout this chapter certainly do not represent an exhaustive list of evaluation issues; however, they do provide a starting point for further analysis.

The following checklist is intended to serve as a quick-reference guide to key factors important to the evaluation of planned-change efforts. Use of the checklist can help evaluators plan a strategy for investigating the many important issues involved in analyzing planned-change efforts.

Checklist

I. THE PROBLEM (PURPOSE OF THE PROJECT)
  A. Identify the performance gap which the change-effort is intended to close.
  B. Identify and list pertinent data relevant to the performance gap.
  C. Determine whether this data supports the previously-specified performance gap. If not, restate it until there is consensus from those concerned with the change-effort as to the actual performance gap.
  D. Determine if the key people agree about the identified performance gap and the need to close it.

II. THE PEOPLE
  A. Evaluate the overall stage of awareness among people involved. Have they:
    1. acquired knowledge about the innovation?
    2. formed an opinion about it?
    3. made a decision to adopt or reject it?
    4. confirmed the decision?
  B. Identify the people in the following roles:
    1. gatekeepers
    2. opinion leaders
    3. formal leaders
  C. Determine which people are the:
    1. innovators?
    2. early adopters?
    3. early majority?
    4. late majority?
    5. laggards or resisters?
  D. Determine the adoption rate of these key people:
    1. gatekeepers
    2. opinion leaders
    3. formal leaders
  E. Determine what role(s) have been played by the change agent:
    1. catalyst
    2. solution-giver
    3. process-helper
    4. resource-linker
  F. Determine whether the change agent was:
    1. internal or external?
    2. similar or different?

III. THE ORGANIZATION
  A. Identify sources of institutional support and estimate the strength of that support.
  B. Identify possible sources of resistance to the change:
    1. cultural
    2. social
    3. organizational
    4. psychological
    5. specific attributes of the innovation
    6. political
    7. external forces
  C. Determine the status of the project within the organization:
    1. initiation stage?
    2. implementation stage?
    3. incorporation or continued-implementation stage?
    4. termination stage?
  D. Determine if the innovation has been developed internally or externally.
  E. Determine the current level of

usage of the innovation.

F. If at the implementation stage, specify the variety and degree to which the implementation is being supported.

G. Determine the current level of implementation and usage of the innovation. Analyze the reasons for variation from expected level.

H. Determine the level of satisfaction with the outcomes of the innovation among members of the organization. Is it doing what it was supposed to do?

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B. APPLICATIONS

Chapter 31

Faculty Development (FD), Organizational Development (OD), and Instructional Development (ID): Choosing an Orientation

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Instructional improvement agencies exist in many organizations. The roles of these agencies vary greatly. It is important for such agencies to do well what they do. It is, therefore, imperative that these agencies not try to be all things to all people, for seldom in these austere times will resources be adequate to do so. This chapter provides guidance in the choice of which emphasis (FD, ID, OD or some combination) an organization should adopt. Seven alternative emphases are outlined.

INTRODUCTION

Over the past decade, a trend in higher education has been to establish centers, agencies, and programs which have the mission of facilitating the improvement of teaching. By the mid-1970s, programs for the improvement of teaching had been created in over one-half of the 2,600 accredited degree-granting institutions in the United States (Centra, 1976). Variability in the organization and placement of these agencies has been well described by Durzo (1978).

The broad range of activities performed by these instructional improvement agencies has been described by a number of authors including Lindquist (1978), Bergquist and Phillips (1977), Centra (1976), Alexander and Yelon (1972), Merry and Allerhand (1977), and Sargent (1979). Several authors, such as Gaff (1975) and Bergquist and Phillips (1975), suggest that the extensive range of instructional improvement agency activities be classified into three categories: (1) Faculty Development (FD), (2) Instructional Development (ID), and (3) Organizational Development (OD).

It has gradually become evident that various instructional improvement programs across the country have emphasized different categories of activities. For example, many programs have emphasized the development of self-awareness and teaching skills of faculty members (FD). Other programs have emphasized the development of adoption of innovative methods of teaching (ID), and still others have focused upon improving the organization within which instruction takes place (OD). The questions naturally arise as to what programmatic emphasis should an instructional improvement agency follow? What are the implications of emphasis upon FD, OD, or ID on the efficiency, effectiveness, and even the survival of an instructional improvement agency? Can or should such an agency address a broad range of activities or should it specialize? What are some criteria which might be used to decide upon an appropriate program or agency emphasis?

The purpose of this chapter is to raise some of the issues and concerns that an instructional improvement agency or program should consider in selecting an emphasis or orientation for its services. The chapter will first present some assumptions and definitions, followed by a discussion of the relationship between FD, OD, and ID, including the concept of "readiness for innovation." Next the authors will present three factors which should be considered in selecting an orientation or emphasis. The chapter will conclude with a disucssion of seven alternative emphases and their implications.

ASSUMPTIONS AND DEFINITIONS

This chapter assumes that in order for the process of teaching or the process of learning to improve, some aspect of the existing instructional system must change. The faculty members' knowledge, skills, or attitudes must change; the instructional content or process must change; or the organizational environment in which instruction takes place must change. Any instructional system component or change perceived as new by an adopting individual or group is defined as an instructional innovation. Thus, the fundamental assumption of the chapter is that teaching and learning can be improved if an appropriate instructional innovation is adopted by individual faculty members and accepted by their organization.

It is recognized that the term "instructional innovation" is a relative one; an idea or technique perceived as new by one faculty member or department may not be perceived as new by another. Moreover, it is acknowledged that adoption of a particular instructional innovation by a faculty member and her/his organization is no guarantee that instructional efficiency or effectiveness will be increased. Nevertheless, improvement of teaching or learning at any level is assumed to involve the adoption of some instructional innovation by faculty members and their organization.

The Relationship Between FD, OD, and ID

Before dealing with the selection of emphasis for an instructional improvement agency, it will be useful to review the relationship between FD, OD, and ID within the context of improving instruction throught the adoption of instructional innovations. For purposes of this chapter, FD, OD, and ID are defined as follows:

> Faculty Development emphasizes activities which increase the faculty members' knowledge, skills, sensitivities, and instructional techniques, so that they are better able to fulfill their teaching responsibilities.
>
> Organizational Development emphasizes activities which seek to change the structure, policies, and organizational environment in which instruction takes place in order to make that environment more supportive of instructional change.
>
> Instructional Development emphasizes those activities that deal directly with the systematic design, development, implementation, and evaluation of instructional materials, lessons, courses, or curricula in order to improve student learning or teaching efficiency.

As discussed in a previous paper (Abedor and Sachs, 1978), the authors contend that FD, OD, and ID are integrally related to each other within the larger process of bringing about the adoption of an instructional innovation having the potential for improving teaching and learning. We suggest that there is a spiral relationship between FD, OD, and ID because FD and OD can create readiness for the instructional innovations produced through ID. That is, ID is a systematic method for finding, modifying, or developing instructional innovations. But finding, modifying, or developing an instructional innovation, however, is only a part of the larger process of bringing about instructional change. It is also necessary that the innovations be accepted by the adopting faculty and their organizations. Therefore, both individual faculty members and their organizations must be made "ready" to adopt an instructional innovation developed through ID. "Readiness" for innovation is created by FD and OD activities, and is a major factor in determining the degree to which ID activities will be undertaken and the degree to which they will be successful.

Readiness for instructional innovation (i.e., readiness to engage in ID) involves both individual faculty members and organizational components (Abedor and Sachs, 1978). It is the combination of individual and organizational readiness that facilitates the ID process and the adoption of innovations. Characteristics such as existing attitudes, beliefs, values, skills, and knowledge all tend to influence a faculty member's readiness to engage in instructional innovation. Unless an individual faculty member possesses some minimal level of readiness, it is unlikely that s/he would voluntarily become involved in instructional innovation--ID.

But no matter how "ready" an individual faculty member might be for ID, if any instructional innovation is to survive in the long term, then the organization within which the faculty member functions must, at the very least, tolerate or accept the innovation. In this regard, organizations possess several characteristics which affect their readiness to change or to accept the innovations proposed by their members. These characteristics include the structures, rewards, norms, resources, and policies of the organizations. Again, unless there is some minimal level of organizational readiness, it is unlikely that any individual member's instructional innovation will survive very long.

It should be emphasized that it is the combined level of individual faculty readiness and organizational readiness which determines the degree to which ID activities will be engaged in and whether any resulting instructional innovation will achieve long-term survival. But what if either individual or organizational readiness is too low for ID--what then? In such a case, the instructional improvement agency could pursue one of two courses of action. One alternative would be to reduce the perceived innovativeness of any instructional change to a level which is compatible with the existing level of readiness. In other words, the agency would seek to engage the faculty member and her/his organization in a simpler, more elementary level of ID resulting in less innovative instructional changes. The underlying principle for this alternative is that those instructional innovations which are most likely to be adopted and used on a long-term basis are those in which the actual change involved (the innovativeness) does not exceed the existing level of individual and/or organizational readiness.

For example, if there was not a sufficient level of readiness to support the development and adoption of self-paced, modularized, instructional units (a rather radical change from conventional lectures), a faculty member and her/his department might be willing to adopt the innovation of a slide-tape program to substitute for a regular lecture--a less radical change. If this innovation proved successful, the overall level of readiness would probably be increased and the use of slide-tapes could be extended to additional lectures. In this way, the individual and the organization could eventually achieve a level of readiness which would support the originally-proposed innovation: self-paced, modularized, instructional units.

As an alternative to lowering the level of innovation to suit the existing state of individual and organizational readiness, FD and OD activities can be introduced which are designed to increase the level of readiness. For example, faculty members may be encouraged to attend workshops or seminars provided by the instructional improvement agency, make site visits to centers of instructional innovation, or attend professional meetings which emphasize teaching in their respective disciplines. Organizational development might be stimulated by agency staff interviewing department chairpersons or deans to identify instructional, organizational, or resource allocation concerns which might be addressed. In this sense, FD and OD may be regarded as processes through which individual and organizational readiness for instructional innovation can be increased. It is interesting to note that in describing FD programs nationwide, Gaff (1975) indicated that changes in factors such as faculty attitudes, values, skills, and sensitivities were important FD outcomes--the same outcomes that can influence individual readiness. Moreover, Bergquist and Phillips (1977) suggest that OD activities should emphasize structural changes, resource allocation, and faculty reward systems--the same factors that affect organizational readiness for instructional innovation. It can be said, therefore, that while FD and OD activities can have other outcomes, they can certainly be oriented towards increasing the level of individual and organizational readiness for instructional innovation.

In answering the question, then, as to what is the relationship between FD, OD, and ID, it is suggested that the relationship is spiral. FD and OD can create or increase the readiness for the innovations produced through ID. Success with early innovations in turn creates additional individual and organizational readiness for more radical innovations. Thus, FD, OD, and ID can each contribute to increasing the level of readiness, which gradually permits more radical innovations to be introduced into a given instructional system.

THREE FACTORS TO CONSIDER IN CHOOSING A PROGRAMMATIC EMPHASIS FOR AN INSTRUCTIONAL IMPROVEMENT AGENCY

It has been suggested that FD, OD, and ID all play an important part in the overall process of improving instruction through the development and adoption of instructional innovations. It has also been observed that some instructional improvement agencies across the country tend to emphasize one or perhaps two programmatic areas (e.g., FD and ID), while others try to maintain a balance between FD, OD, and ID activities. From the standpoint of efficiency, effectiveness, and survivability, what agency stategy is best--to emphasize one kind of activity (e.g., FD), to focus upon two kinds of activities (e.g., FD and ID), or to seek a balance across all three? What factors or criteria might be used in making this decision?

In answer to these questions, we suggest that there are at least three factors an instructional improvement agency should consider in determining whether to emphasize FD, OD, or ID. The three factors are:

1. The overall level or readiness for innovation.
2. The size and capabilities of the instructional improvement staff.
3. The availability of outside consultants.

Factor 1: The Overall Level of Readiness for Innovation

While there is no precise formula for calculating the levels of individual and organizational readiness, it is possible to identify the critical features which could either facilitate or block the adoption of an innovation. Through in-depth interviews with faculty members and administrators, careful analysis of past ID projects, collection of survey data, and group discussions, enough information can be gathered to describe the level of readiness.

There are many sources which can be used to develop the questions that might be asked in assessing the overall level of readiness (for example, see Beckhard, 1969; Bergquist and Phillips, 1977; Dwyer, 1976; Lindquist, 1978; Spitzer, 1976 and 1977; and Watson, 1974). When working with groups, the nominal-group technique (Delbecq, Van de Ven, and Gustafson, 1975) is an excellent method of identifying and prioritizing issues without having the group become polarized or wasting time on spurious issues. Other useful strategies for collecting information from individuals in group settings can be found in Merry and Allerhand (1977).

Of the many characteristics which can contribute to individual faculty and organizational readiness, several were selected by Abedor and Sachs (1978) as appearing most important. These individual faculty characteristics include:

1. ATTITUDES which are positive toward self, teaching, and change.
2. VALUES which place importance on teaching and student learning.
3. BELIEFS that instructional improvement is possible and worthwhile.
4. SKILLS in organizing and delivering information.
5. KNOWLEDGE of subject matter, innovations, and teaching methods and strategies.

The characteristics that are most important for organizational readiness are:

1. STRUCTURE which allows open and free communication and group problem-solving.
2. REWARDS for teaching or related activities.
3. NORMS that support innovation.
4. RESOURCES to support innovation.
5. POLICIES that permit trial of innovations.

Just as there is no precise formula for calculating the overall level of readiness, it is not possible to define a single level of readiness which is "enough." This is because different levels of innovation require different levels of readiness. For example, adding overhead transparencies to a lecture is a less radical innovation and would require less readiness than changing from a lecture format to self-instructional modules.

Rogers and Shoemaker (1971) describe five characteristics of innovations which can be used to identify the relative innovativeness of a proposed change. Later work by Caffarella, et al. (1979) confirms the usefulness of this framework. The five characteristics are:

1. The relative advantage of the innovation compared to the existing practice.
2. The compatibility of the innovation with the existing practice.
3. The complexity of the innovation.
4. The ability to try out the innovation prior to full-scale adoption.
5. The ability to observe results of the innovation showing it to be an improvement over the existing practice.

In sum, the assessment of the overall level of readiness would be a major factor in determining whether to emphasize FD, OD, or ID activities. Overall readiness would be determined by collecting information about the five characteristics of the organization in which the innovation would be used. The relative innovativeness of any proposed change should also be factored into the decision process. An innovation representing a small change from the status quo might easily be compatible with the existing level of individual and organizational readiness; hence there may be little need for FD or OD. On the other hand, a major instructional change may exceed the existing level of readiness and require considerable FD and/or OD before adoption is possible.

Factor 2: Size and Capabilities of the Instructional Improvement Staff

The size and capabilities of the instructional improvement staff has much to do with whether an instructional improvement agency should emphasize FD, OD or ID in its activities. An ID-oriented program will require the largest staff since each member will be limited in the number of faculty members which can be assisted at one time. Diamond, et al. (1975), in one of the few texts which deal with administering an ID service, suggests that a single developer can handle only three or four major projects (where the developer and faculty member collaborate in the effort) at a time. This suggestion seems to be borne out in current practice in many ID centers around the country.

Close collaboration between the developer and the faculty member is a good strategy when the design will be complex or when the faculty member has little ID skill. Yet, the amount of time required of the developer can be adjusted depending upon who is expected to do the actual development work. In a pure ID setting, the developer will assume the major responsibility and can work on fewer projects; but as the setting changes toward FD, with the developer only providing suggesitons or tutoring the faculty member on how to perform various ID skills, a greater number of faculty members can be served. Davies (1975) provides a good description of various developer-client orientations.

An FD-oriented program can function effectively with a smaller staff since a great many FD activities can be provided through workshop formats in which one staff member deals with 10, 20, or more individuals at a time. Since the goal of such FD programs is to equip faculty members to do their own ID, there is less of a limitation on the number of faculty members served. This does not imply that an FD-oriented program is highly theoretic rather than "hands-on." Many very successful FD workshops are designed to allow participants to improve their own course materials or to practice and receive feedback on their presentation skills while teaching one of their own lessons.

An OD-oriented program can also function with a very small staff (perhaps only one person) whose function is to coordinate the OD efforts, support the changes being carried out by members of the organization, and facilitate the institutionalization of those changes. OD is not something a developer does for an organization; it is something the members of the organization must do for themselves with the guidance of the developer.

OD is generally more successful when outside consultants or special interdisciplinary task forces are used (Fullan, Miles, and Taylor, 1980; Bennis, 1969). Or, as Margulies (1972) pointed out when he described an OD project at a western university:

> One major problem in organizations in general is the resistance to accepting help. In universities the issue probably is of major importance. The academic culture, for example, requires that the "help" process be conducted by individuals with all the necessary paraphernalia and credentials.

Since an instructional improvement agency rarely performs OD without some ID or FD, it is usually desirable to limit the amount of OD it undertakes on its own. The delicate and somewhat threatening nature of OD could put the instructional improvement agency in a dangerous position if it attempts to do too much without the legitimization provided by outside consultants or task forces. In the process of resolving conflicts between the faculty and the administration, for example, its own reputation could become so tarnished that it loses the appearance of neutrality necessary for successful ID and FD.

Factor 3: Availability of Outside Consultants

Outside consultants can be used to augment the instructional improvement staff and are the "wild-cards" in the FD, OD, ID selection process. As pointed out in the preceding section, outside consultants are very important to successful OD activities, particularly if organizational readiness for innovation is low. However, outside consultants can be used to strengthen FD and ID activities as well. If outside consultants are available to conduct FD workshops (and if funds are available to pay for these services), the instructional improvement staff might then be free to take on ID projects. An outside consultant might also be hired to do ID, either in collaboration with a faculty member or with an agency staff member, thus providing a temporary ID thrust which would not otherwise be available.

Deciding whether and how to best use outside consultants has been a topic of several recent texts such as Pilon and Bergquist (1979), Bell and Nadler (1979) and Brown, Wyne, Blackburn and Powell (1979). Some authors favor the use of outside consultants over the hiring of additional in-house staff. They argue that it is cheaper, in the long run, than hiring permanent staff; the instructional improvement agency has more flexibility and access to a wider pool of expertise; and the consultants, rather than the in-house staff, can absorb project animosity should any occur. The critical assumption in the use of consultants, however, is that the employing agency has accurately diagnosed its own needs and knows exactly what kind of consultant should be hired. This assumption, unfortunately is not always met. Another possible flaw in the use of consultants is the fact that consultats leave but projects continue. There needs to be some kind of in-house follow-up support after an FD, OD or ID consultant has done his/her "thing" for the instructional improvement program. In sum, the use of outside consultants is a feasible mechanism for augmenting FD, OD, or ID activities or for giving an instructional improvement program a temporary boost in a weak or nonexistent area. The decision to use a consultant should be based upon an accurate assessment of the need for a particular FD, OD, or ID activity, which in turn should be based upon the assessment of the overall readiness for innovation of the faculty and upon the size and capabilities of the staff. In any case, some in-house follow-up support is desirable following any intervention by an outside consultant.

SEVEN ALTERNATIVE EMPHASES FOR INSTRUCTIONAL IMPROVEMENT PROGRAMS

At the beginning of this chapter it was mentioned that various instructional improvement programs across the country have differed in their emphasis among FD, OD, and ID activities. The next section suggested several criteria which might be used in selecting an appropriate emphasis. This final section will describe seven alternative program emphases and suggest several advantages and disadvantages for each. Figure 31-1 summarizes the various options with respect to program emphasis. The names given to each option are intended to be descriptive of the emphasis the option represents.

Training Programs

This popular approach is primarily an FD orientation that provides such services as skill building workshops, travel support for faculty, and values clarification exercises. There is little or no active involvement in ID or OD. Among the strengths of this type of program are its ability to reach a large number of faculty members efficiently and the placing of responsibility for improving instruction upon the individual faculty member. However, there are a number of important drawbacks to its use. For example, there is no guarantee that the faculty member will actually apply the training to the improvement of instruction, or that the training will provide enough skills to allow them to do so. Furthermore, as the faculty members attempt more instructional innovation on their own, there may not be sufficient organizational resources to support all the proposed changes or to differentiate among those changes in order to support those which promise the greatest payoff. And, when a faculty member leaves the organization, the results of the training will leave also.

Traditional OD Emphasis

This is an orientation which provides little or no FD or ID involvement. While rarely practiced by instructional improvement services, it can be found in institutions where the only instructional

Figure 31-1. Level of FD, OD, or ID activity associated with different program orientations.

Program Orientation	Level of Activity* FD	OD	ID
a. Training	high	low	low
b. Traditional OD	low	high	low
c. Traditional ID	low	low	high
d. Organizational Renewal	high	high	low
e. Change Agent/Service Agency	high	low	high
f. Management Consultant	low	high	high
g. Comprehensive Development	high	high	high

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*Where a low level of activity is indicated, it is assumed that either the faculty or organization is already at a high enough level of readiness or that the individual or organization will perform the function without assistance from the instructional improvement agency.

support is provided by the office of institutional research or where administrators bring in OD consultants to "improve the instructional climate." This type of program can create a climate in which the faculty is more free to innovate and where more of the organization's resources are available to support such innovation. However, there is no direct application to the improvement of instruction and all improvements depend upon the existing skills of the faculty. Another drawback to this approach is that, while the OD is going on, the faculty may avoid making any significant course changes, waiting instead until the turmoil and organizational change settles down.

Traditional ID Emphasis

The ID orientation is typified by those programs that operate a service-on-demand basis. These programs may advertise their services but do not normally engage in FD or OD to increase readiness. However, through repeated successes with ID projects, readiness can be increased. The availability of professional ID assistance increases the likelihood that there will be successes and that instructional improvement projects will be of a higher quality than if such assistance were not available. Unfortunately, the number of projects that can be undertaken will be limited by the size of the staff, and the nature of the innovations which can be proposed will be limited by the existing levels of individual faculty and organizational readiness. One great danger faced by ID-only programs is that they will lose administrative support because too few faculty members are ready to seek their help or because those few faculty members who do ask for ID assistance are not perceived as being important enough by the administration to justify the expense of the ID program.

Each of the preceding program orientations is impractical in most settings because each either fails to sufficiently promote readiness or fails to provide enough substance to significantly improve instruction. Instructional improvement agencies are thus more likely to employ one of the orientations described in the following, which combine the strengths and overcome some of the weaknesses of providing FD, OD, or ID alone.

Organizational Renewal Programs

This type of program combines FD and OD in order to create a climate which allows faculty members an excellent opportunity to innovate on their own. Little or no ID assistance is provided. This type of program can also allow the organization to establish new mechanisms for prioritizing and supporting its instructional improvement efforts. Nonetheless, with this approach instructional improvement is still limited by the skills of individual faculty members and their willingness to actually apply the training they receive.

Change Agent/Service Agency Programs

The majority of instructional improvement agencies probably use this orientation, combining an emphasis on FD with an emphasis on ID. It allows them to take active steps to increase individual faculty readiness for innovation through FD, and to provide ID services for larger and more complex projects which are beyond the skills of the individual faculty members. Such programs seldom, if ever, undertake OD. This mix of FD and ID is a strong one because it can reach a large number of faculty members and give them tools to improve instruction on their own, while providing professional ID assistance that can improve the quality and the potential for success of ID projects. Any such successes help further increase the overall level of readiness. However, it is possible for the instructional improvement agency to generate more demand for ID assistance than it can provide or more interest in innovation than the organization is ready for. Furthermore, just as when FD and ID are practiced alone, there is no guarantee that faculty members will apply their training to real instructional problems or that those who need help will seek it without direct intervention by the organization's administration.

Management Consultant Program

New departments or major institutional restructuring, or some type of emergency needs, may lead to a program with an ID-OD orientation. While the role of faculty in designing or improving instruction is not denied, the press of time and need to address specific problems in the most effective and efficient method rules out FD. Of course, this can lead to serious problems if the faculty is not ready for the innovations developed by the ID staff. This approach allows for major changes that the organization might not otherwise accept, but develops little commitment on the part of the faculty to continue to upgrade the courses after the ID staff has completed its work. This orientation may be good for getting a new academic or training program started quickly, but after the OD effort is well under way the program usually begins to revert to an ID-only program unless another orientation is chosen.

Comprehensive Development Program

When an instructional improvement agency offers FD, OD, and ID, it is in the strongest position to improve instruction and create conditions which encourage and assist faculty members to make really significant improvements in their courses. Yet, there is a temptation with such a broad program to try to do too much too quickly. It is just as important with the comprehensive program as it is with all the others to let the overall level of readiness be the limiting factor on instructional innovation. This comprehensive orientation simply offers more latitude for increasing that readiness.

CHOOSING AN EMPHASIS: FD, OD, OR ID

At this point, it would be highly desirable to present a flowchart or other decision aid that includes all the options and indicates which of the seven program orientations would be most appropriate. Unfortunately, the decision process is far too complex and imprecise for such an approach. There are too many intervening variables, such as organizational politics, personalities, budgets, and climate, that affect the choice of an orientation.

Nonetheless, we offer the following guidelines to assist in choosing an orientation. First, if faculty and organizational readiness are not above some minimal level, then the orientation of the program should include FD, OD, or both. Second, if the instructional improvement staff is small and consultants are not available, then it would be a good idea to avoid orientations that require ID. If consultants are available, then some ID can be undertaken in conjunction with FD. Third, if consultants are not available then OD orientations probably should be avoided. Fourth, if organizational readiness is a problem and outside consultants are not available, FD or successful small-scale ID projects should be used. This will raise the overall level of readiness to compensate for the low level of organizational readiness. While it may severely limit what can be done, it is better than spending all the agency's resources and credibility fighting the system and having little or no direct impact upon the improvement of instruction. The application of some of these guidelines can be seen in the following examples.

Small Staff—Tough Situation

The first example involves a small junior college tightly controlled by its president and its business manager. The focus of the institution was on vocational courses with most of the faculty drawn from practicing professionals in the community. Most had little or no teaching experience and all had heavy teaching loads. The reward structure at the college was weighted toward longevity and cooperation with the administration. The instructional improvement staff at this junior college consisted of one full-time audiovisual director/instructional developer and one full-time audiovisual technician.

While FD and OD were called for, OD was ruled out due to lack of administrative support and to a lack of staff. FD was a problem because the administration had experienced many problems with workshops in the past and wanted instructional improvement handled on a one-to-one basis with individual faculty members.

The instructional improvement program finally initiated was the change agent/service agency orientation (FD and ID). Given the small staff, no large ID projects were attempted since they would have required too much of the developer's time. Instead, the developer identified particular needs which could be met quickly and easily. For many faculty members this involved finding one or more films to rent and building units of instruction around them. Success with these quick and dirty units built up faculty trust and interest in the instructional improvement service, and allowed the developer to tutor faculty members individually or in groups of two or three. This tutoring took the form of discussing faculty problems, proposing possible solutions, and giving the faculty members the tools and guidelines for making their own improved materials, or providing models of instructional techniques (good lectures, handouts, syllabi, etc.) which they could imitate.

One major aspect of this program was that the developer placed most of the responsibility for choosing the appropriate innovation and adapting it to a particular course in the hands of the faculty member. This allowed the developer to work with more faculty members and to provide each with enough guidance to insure successes. It allowed the faculty members to work within their existing levels of readiness. And it allowed the administration to accept these small changes without feeling unduly threatened. Within about a year faculty members were seeking more and more help; several of them were trying to get support for larger ID projects; and the administrators, pleased with the signs of instructional improvement they could point to, were beginning to ask what other things could be done. This is an illustration of the symbiotic relationship that allows readiness to be increased when other avenues are blocked.

Flexibility at a University

The second example involves a large university with a number of full-time developers and with the ability to make some limited use of consultants. Because of its size and open administration, the developers were reasonably free to do what they wished. When they needed special organizational cooperation, they were generally able to get it by working with the vice president for academic affairs. Teaching interest and abilities varied across the campus.

Initially, the instructional improvement agency took a comprehensive development orientation (FD-OD-ID) but found that the OD component was causing some problems even though they used an outside consultant to assist them. Because OD took a lot of time and created a certain amount of disruption within the organization, some resentment toward the agency built up among various faculty members and department chairpeople. While a certain amount of this resentment was natural resistance to change, the agency found that a disturbing amount was because people were being asked to spend time and energy on non-problems. After almost three years, the program was modified to a change agent/service agency orientation, but bad feelings remained for some time after the change. In this case, the agency did not account for the level of readiness that already existed and it got them into trouble.

Purchasing Instructional Improvement

The third example involves a new professional school which was in the midst of rapid growth. To provide coordination and quality control of instruction without taking up too much time that was needed for other matters, the administration and faculty agreed to try the management consultant model (OD-ID). An instructional improvement coordinator was hired to work either with consultants or temporary employees on the design of specific competency-based courses, and to develop the policies and procedures necessary to integrate these courses with the existing non-competency-based courses still being taught.

Initially this process worked well, as the existing courses outnumbered the new ones. It was a fast way of putting together courses and setting up the organizational structures necessary to monitor them. However, when it came time to convert some of the existing courses to a competency-based approach, faculty resistance developed and the entire project ground to a halt. This particular program orientation was appropriate for the initial start-up, the individual faculty members were ready for that, but when used on a sustained basis without increasing individual readiness, it was too much for them.

SOME CONCLUDING COMMENTS

Not all instructional improvement requires radical innovation. Nor do instructional improvement agencies need to play major roles in solving all instructional problems. Faculty in many cases are willing and able to make major improvement given a little help. As Geis and Smith (1979), found in their study of faculty perceptions of teaching and learning, faculty believe that given time and a small amount of resources they can make the necessary improvements themselves. While faculty-directed projects may be smaller or less effective than those conducted with instructional improvement agency input, they are legitimate efforts that ought to be encouraged, rather than put on hold until the agency has time to work with them. The implication is that faculty members may be ready to proceed, and that they need a few ID skills more than they need an ID consultant to help them.

In the end it is the sensitivity, effort, and skill of the developer that will govern the selection of the instructional improvement agency's orientation toward FD, OD, and ID. After all, since there is no single correct formula for improving instruction, it is up to the developer to find a combination of activities or emphases that gets the most out of the time and effort spent upon the improvement effort at his/her institution. By raising some of the issues and concerns which should be addressed in choosing an emphasis, it is hoped that the productivity and effectiveness of our instructional improvement efforts will be enhanced.

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Chapter 32

Toward a Faculty Self-Appraisal and Development Program — A Readiness Based Approach

Ron J. McBeath

Faculty development can be considered the improvement of faculty members, much as instructional development is the improvement of instruction. This chapter presents a model with which to visualize the faculty development process. The application of that model at San Jose State University, along with the material which grew out of that experience is then described. Evaluation data from those who have used the material is also provided.

How does faculty development relate to instructional development? What connection exists among the areas of faculty development, instructional development, and audiovisual media services? What percentage of a college faculty is ready or can be encouraged to take advantage of each of these services?

These questions must be considered if an effective faculty development program is to be implemented. However, because of the diversity among universities, the different relationships existing between administrators and faculty members, and the different expectations held by students, the answers may vary significantly from institution to institution.

This chapter will review the steps taken at San Jose State University which have led to the important goal of establishing a faculty self-appraisal and development program. Attention is given to each of the following:

Guidelines for a development program.
The media services program.
Reorganization and integration of instructional development and media services.
Expansion to a faculty self-appraisal and development program.
Evaluation and the future.

Each of the above elements has been implemented in the order listed. The experiences gained at each stage have provided the bases and established the necessary degree of readiness for us to expand and advance to the next activity. This pattern of growth was essential in allowing us to recognize the needs of faculty members which ultimately resulted in the faculty self-appraisal and development program.

GUIDELINES FOR A DEVELOPMENT PROGRAM

The description of the program must be preceded by an explanation of the theoretical framework upon which the development of each of our program elements at San Jose State University is based. A transformational change-model, described below, was constructed which provided a comprehensive basis for working with the faculty, helping us to anticipate their needs, and helping us to design the faculty-development program.

A Model of Transformational Change

We all accept change as a constant in our lives, but in educational theory we have tended to accept a "pendulum swing" theory of change based upon such dualisms as traditional and progressive, subjects and methods, faculty and students. Our acceptance of these polarities is a highly-ingrained part of our Western culture. It is not until we recognize the futility of trying to use these closed-system constructs for planning that we question their validity.

The present model (McBeath, 1969) emerged over a period of years during the 1960s as a result of looking for ways to plan for change in education and professional development. After examining technology and science as the major agents for producing change in our society, it became evident that a series of changes or developments can be observed in each of the areas studied. A three-stage format has been developed to depict these changes for several technologies during the agricultural, industrial, and technological eras (see Figure 32-1). An examination of the progressive changes which have occurred in the technologies of transportation, power, and industry (left to right, Figure 32-1) shows this pattern of development. Within the field of science a parallel progression can be seen in the triads.

The addition of further triads shown in the model (Figure 32-1) reveals relationships and a structure which warrants the categorization of stages. The model shows that change is sequential and that the type of emergence from one stage to another is transformational.

One of the most significant implications revealed by an examination of growth in technology and science is that the scientific principles which are developed in an era enable society to create with and to control the technology of that era. Attempts to use the principles of an earlier period with the new technology result in a systems mismatch and problems. The closed system, two-staged, polarized approach is inadequate for dealing with problems of the future in both society and education.

After describing the patterns of change that have been taking place in technology and science, the author recognized that a similar structure could be identified for education. The three-stage model depicting transformational change in education is outlined under the headings of principles, practices, and outcomes.. As the model shows (Figure 32-1), the direction of change is from autocratic and permissive toward democratic control; from doing things "to" or "for" to doing things "with" students; from logical thinking and rote memorization, through logical thinking and free expression, to a balance of logical and creative thinking.

As educators, we characteristically gravitate to one stage or another, depending upon our experience, our attitudes, and our professional expectations. Whatever our focus, there can be movement in either direction--toward adventure and risk in the future, or in the reverse, toward the psychological security of the past. Stage I incorporates the traditions of the past and reinforces the dependency syndrome in students. In Stage II, concerns are with the processes of the present and reinforcement of independence in students, while in Stage III the new focus is upon outcomes in the future and interdependence.

From discussions with over one hundred groups, there is general consensus that probably 70 percent of us are at the Stage I level, about 25 percent at Stage II, and possible five percent at Stage III, with respect to our beliefs and educational practices. These figures cannot be considered definitive, but they can be regarded as indicators. The model demonstrates that as faculty members we are all at different levels or stages of behavior and readiness in terms of our practices in teaching, motivating, using resources, and relating to students. It shows how our practices relate to both our principles and to the educational outcomes. Place yourself in this plan. Look over the summary of the structure of the model in Figure 32-1. At which stage do you find yourself in terms of your own beliefs and practices?

This organization of educational principles, practices, and outcomes into at least three distinctive stages provides a convenient basis for decision-making in educational and professional development. Because of this, the three-stage model was used as a guideline for reorganizing the media services, introducing faculty to instructional development, and implementing the faculty self-appraisal and development program.

THE MEDIA SERVICES PROGRAM

Over a period of 20 years the range of media resources available to educators grew as new technologies became available. Films, slides, and graphics grew into audiovisual departments, tapes and tape recorders were organized into language laboratories, and television led to the development of instructional television departments in larger universities. In general, each department had its own distribution, production, and technical-support staff. This pattern was followed at San Jose State University.

Both faculty and students were served. As the model indicates, most of the service requests were initially for "audiovisual aids" as supplements to instruction, but gradually media were increasingly used to help add interest and clarity to classroom presentations. Films, audiotape and videotape services are used by a large proportion of the faculty members periodically.

By helping these media-users to use the "right tool in the right way on the right occasion," we gained experience in working with faculty members in a direct and concrete way. When materials were not commercially available, we were able to help faculty members with the development of resources for instructional purposes through our consultation and production services.

The advent of television and of teaching

Figure 32-1. A Model Depicting Change as Sequential, Emergent and Transformational.

Stage I	Stage II	Stage III
	Developments in Technology	
wheel	motor	jet propulsion
manpower	machine power	computer controls
cottage industry	mechanization	automation
structures and functions	functions in structures	structures for functions
units	networks	constellations
explore	exploit	conserve
	Developments in Science	
certainties	confusion	probabilities
absolutes	relative absolutes	relatives
metaphor	toward models	functional models
linear sets	rationalized structures	emerging patterns
closed system	open system	organic systems
static	dynamic (in flux)	dynamic (evolving)
	Developments in Education	
Principles		
active mind	reactive mind	transactive mind
unity (dualism)	unity (monism)	pluralism
autocratic	laissez-faire	democratic
Practices		
teacher dominated	permissive	inquiry centered
do things to	do things for	do things with
subject emphasis	method emphasis	interdisciplinary emphasis
product oriented	process oriented	performance oriented
extrinsic manipulation	random reinforcement	meaningful involvement
standards grouping	age grouping	readiness grouping
class teaching	group teaching	self paced learning
fixed stimulus	multiple stimuli	organized stimuli
limited access	random access	systematic access
limited resources	multiple resources	instructional systems
teaching aids	audiovisual techniques	instructional technology
Outcomes		
fixed response	varied response	response mastery
convergent thinking and rote memory	convergent thinking plus free expression	convergent and divergent thinking
competitive	cooperative	adventure
inner directed	other directed	self actualizing

© Ron J. McBeath, San Jose California - 1975 machines increased and expanded our skills to the third stage of the model in working with faculty in instructional design and development. Our activities provided assistance with the development of courses using such components as self-paced and small-group learning.

Helping to design and establish an audiotutorial course for 150 students in Botany, two additional courses in Biological Sciences, and then one in the Nursing Department gave us valuable experience with instructional design and with providing service support of a production and technical nature.

At the same time that we were building experience, skills, and credibility, it also became evident that only a small percentage of the faculty members were ready for full course redevelopment. As indicated from discussions about the model, probably fewer than five percent of the professors could be expected to have the energy, time, skills, and dedication for setting up an audiotutorial course using an instructional design model in a systematic way. The model helped us to develop realistic expectations regarding the number of faculty members requiring different types of help.

The hypothesis of the model was confirmed by our experience that approximately two-thirds of the faculty interest in media is at the audiovisual "aid" level, about one-quarter at the audiovisual techniques level, and perhaps one-twentieth at the instructional technology level of Stage III.

REORGANIZATION AND INTEGRATION OF INSTRUCTIONAL DEVELOPMENT AND MEDIA SERVICES

As the integrative nature of the model indicates, professional development ranges through Stages I, II, and III. It was not seen as advisable to try and implement a faculty development program separate from the media service. Media, in fact, were seen as a means of helping to create alternative ways for students to learn as well as for faculty members to teach. Media were also seen as a means for helping students to expand and improve their thinking patterns. Media do this by reducing the dominant role of the faculty and enable the faculty to become regarded more as resource people. Through the use of media, students are given more opportunities for inquiry, self-paced learning, and small-group work.

But we did see a need to change our general approach to organizing the media services and began exploring how to do that in 1970. Figure 32-2, below, shows how the Design and Development Services were made operationally central, with direct relationships to Production, Utilization, and Technical Services.

This type of reorganization has helped to improve communications and has enabled us to provide an improved and more extensive service for the faculty and students. For example, faculty members wanting to make use of films and videotapes now contact one department rather than two. Technical services become involved with both AV and TV equipment, and this gave the technicians an opportunity to become experienced with a greater range of equipment. In the production area, it became possible to have photographic personnel expand into multi-media production for courses using instructional design procedures.

The reorganization created new opportunities, new expectations, and new satisfactions. These changes were not made without some risk or sacrifice, but the rewards in terms of improved service and improved opportunities for personal advancement more than compensated. Staff members who advanced their skills were given new job descriptions and better pay.

The integration of instructional development and media services required credibility with the faculty, together with administrative support. The plan we followed was to introduce instructional development services in 1970, rename the reorganized support services the Instructional Resources Center in 1972, and introduce the Faculty and Instructional Development Office in 1973.

At each step we looked for faculty and administrative support by presenting our proposals through the appropriate committees of the Academic Senate and concurrently keeping the administration informed of the moves we were making.

A major source of external funds became available for instructional improvement projects at the same time that we reorganized. The California State University and College System provided approximately one million dollars a year for innovative projects on the 19 campuses. We saw this as an excellent opportunity to integrate our instructional development services and applied for a grant to help coordinate a series of four innovative projects. Our past experience was valuable in helping to identify innovative faculty members whom we could assist with project development and implementation. The guidelines in the model were also of value in helping to assess the feasibility of various projects and the likelihood of success.

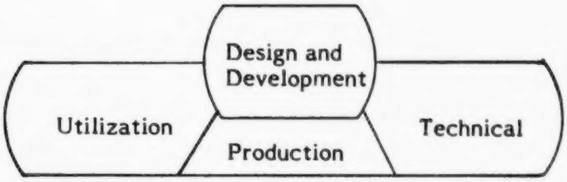

Figure 32-2.

The initial focus of the innovative grant applications was upon the development of learning labs for self-paced and small-group activities. Media were involved in each project. Our experience was most often sought in regard to assistance with media and facilities, but as credibility grew with each individual, we became more involved with instructional design and evaluation activities. On some occasions we became so involved that we were also asked to help reduce hostility among faculty members who disliked the innovation. Our administrative status as a support service and our general prestige with the faculty enabled us to do this.

EXPANSION TO A FACULTY SELF-APPRAISAL AND DEVELOPMENT PROGRAM

Our experience and progress with the overall plan indicated that we were ready to serve faculty members in Stages I and II with assistance in professional development. The timing now seemed appropriate to conduct a University-wide survey to ascertain what professional skills and competencies faculty members would like some help in improving. More than half of the 1,500 faculty members responded to the questionnaire, and there was some indication that they would like assistance in the general areas of lectures, discussions, self-paced learning, tests and evaluation, and faculty-student relationships.

Now that we had identified a realistic need, we made some preliminary explorations to find resource materials and programs which could be used with the faculty. While there were many articles of an exhortative or general nature available, there was very little material which would be of any value in workshops or for self-instructional activities with faculty members.

The type of program we envisaged would have to serve all faculty members. Once again, the model was helpful. We saw the need for a way to help faculty members to identify the level of help they would need in a selected area and thus have the types of resources which would enable them to learn professional skills in a positive, non-threatening way.

An opportunity came to submit a proposal in 1975 to the Fund for Improvement of Post-Secondary Educatioan through the CSUC Center for Professional Development. Using the transformational model as a guideline, we developed a proposal to meet two related objectives:

1. To develop self-appraisal procedures for helping faculty members to identify the professional skills they wished to develop or change;
2. To produce related resources which would be used as self-instructional modules or as materials for workshops in the areas of interest already identified.

The preparation for this proposal provided us with the data-base we needed in order to go about accomplishing our first objective--the development of self-appraisal procedures and forms.

It became evident as we delved into the literature that much of what had been done on the appraisal/evaluation of teachers and teaching was characterized by being overly standardized and highly weighted toward the classroom-performance aspect of teaching.

More than 450 items were gleaned from various surveys, checklists, and opinion-aires. The items, however, were often vague, subjective, and many were poorly written. After reworking and organizing the items under the five major categories of lectures, discussions, tests and evaluation, self-paced learning, and faculty-student relationships, we developed a pool of items which could be drawn from in order to meet different needs as we worked with faculty.

These initial efforts were followed by a decision to develop a single self-appraisal form which could be used as an "engagement" or introductory form with all faculty members. Several criteria and guidelines were established. The form was to be relevant for growth and development in each of the selected areas, the levels of growth outlined were to be descriptive rather than normative, derived from individual rather than from group needs, and useful for both professional and personal growth. We decided that four general levels or stages would be developed to enable faculty members to indicate their readiness for change, and that the main line of development would be toward increasing the scope of learning opportunities for the student and the teachers.

Self Appraisal

The concept of self-appraisal has a long history. Socrates urged "Know thyself." Maslow (1962) has more recently developed a theory about "self direction" and "self actualizing." He depicted people who practiced this as having reached a high level of maturity. The need to stop and reflect and plan ahead has been institutionalized in everyday life with the annual New Year's resolutions.

In education, however, evaluation of our professional lives has typically been left to others. Our colleagues and in many cases our students evaluate us for promotion and tenure purposes. There has been little evidence of "self-appraisal" for improvement, and one strong reason is because there has been very little effort by higher educational institutions to provide any system for in-service or profesional development programs.

A wholistic approach to self-appraisal was seen as necessary; an approach which would recognize that the philosophical assumptions held be each of us regarding the nature of man and the nature of mind would influence our understanding and acceptance of the principles of growth and learning. For example, do we see the learner as good, bad, or neutral? Is the mind active, reactive, or interactive? Our responses to these questions will influence why we teach, what we teach, how we teach, and what expectations we have. Our responses will influence how we motivate, set objectives, use techniques, conduct discussions, and develop relationships with students.

The wholistic approach was seen as necessary because we did not expect to see miracles or overnight changes. Changes were seen as being slow, but incremental, and as having a direction. Some observable individual improvements could be made quickly, but an overall, broad-based improvement would take time and would need both faculty commitment and nurturing through a faculty development program.

What can a self-appraisal form do? It should, in a positive, non-threatening way, help us to take a good look at where we are and see where we would like to be. As faculty members, we build patterns of behavior which are reinforced to some extent every day and week of the year, and they become habits. A good self-appraisal form should help us to assess these habits and find out if we are doing what we believe we are. It should also help us to see what steps we might take to make any desired changes.

The Self Appraisal form

The form we developed (Figure 32-3) is designed to help faculty members to identify their levels of readiness for developing professional competencies in the general areas of instructional strategies (lectures, media presentations, and self-paced learning); test and evaluation of learning; discussion techniques; instructor-student relationships; and course development.

Figure 32-3. A Self-Appraisal Form for Faculty.

The basic purpose of this form is to help you identify professional areas you would like to further develop. The Faculty and Instructional Development Office has assembled various resources and activities which may assist you in meeting the needs you have identified.

Below are listed five major instructional areas. Please read the descriptions under each area and circle the appropriate response(s) for each description...

/A/ NOT NECESSARY--I don't feel that I need help in this area.

/B/ LOW PRIORITY--I am interested, but for the time being, this is a low priority.

/C/ MORE INFORMATION--I'd like to find out more about this area.

/D/ READY FOR ACTION--I would like to become involved in this area **as soon as possible.**

INSTRUCTIONAL STRATEGIES (Lectures, Self-Paced Learning, etc.):

A B C D Give effective lectures with clear goals, appropriate examples, and in a well organized manner.
A B C D Make use of a variety of media and resources in my instruction to add interest and clarity.
A B C D Provide opportunities for independent study and small group work through planned modules and support resources.
A B C D Design an instructional system in which the students are pretested and guided into alternative activities (self-paced and group) to reach desired learning outcomes.

TESTS AND EVALUATION OF LEARNING:

A B C D Use assessment techniques to measure the student's knowledge of the course content, based on my standards from previous semesters.
A B C D Use assessment techniques to measure the student's understanding and ability to apply his knowledge.
A B C D Use assessment techniques to measure the student's levels of knowledge, ability to use intellectual skills, and develop attitudes toward further learning.
A B C D Use assessment techniques to measure the student's competency to use knowledge and intellectual skills for analysis and problem solving.

The four readiness levels are based upon the transformational change model described earlier, and depict four different professional styles. Each level is represented by a single question in each of the Topic Sets on the form. Most faculty members, probably two-thirds, take the scholarly or the research oriented, traditional approach, and their instructional strategy places an emphasis upon lecture presentations. A smaller group, about one-quarter, takes a greater interest in providing some variety in their teaching through the use of media. The third level (possibly one-tenth) takes a more task-oriented approach and organizes opportunities for students to learn with self-paced materials and in small groups. Those using the fourth style, fewer than five percent, design teaching and learning activities which include elements of the other three styles, integrated to meet the needs of the situation.

Validation of the Self-Appraisal Form

Steps were taken through each phase of the project to try out the materials on faculty members both as individuals and in groups. The direct feedback obtained helped to test and refine the materials. In addition to involving members of the Academic Senate through the Improvement of Instruction Committee, several departments, including Counselor Education, Nursing, Biological Sciences, Natural Sciences, Aeronautics, Business Management, and others, participated. Meetings were also held at other universities.

The results of these meetings were enlightening, and friendly participants were not hesitant to express hostility upon occasion. The hostility was directed generally at what they considered would be administrative misuse of the materials and the program. Many productive comments were made and resulted in some modifications.

We have concluded that no single evaluation procedure or technique would be wholly successful with any group of faculty members, and also that the faculty should be given information about the resource units available so that they could see the program in its entirety and realize that it is not just another evaluation procedure.

The Modules

A series of 20 different modules has been prepared. Most of the modules are organized as a set consisting of a text and a workbook. The text provides narrative information and practical summaries, based upon experience and current literature. Exercises and examples in the workbook are drawn from many college-level subjects. Answers to exercises are discussed in the text and guidelines are given for applying the concepts and techniques to a specific unit in a selected course.

The materials, which are described below in their newly-revised form, can be used in a self-instructional way or in workshops, where a coordinator of professional development can serve as a group leader. The content and organization of these materials encourages participation and interaction among faculty members from diverse backgrounds.

The Module, Setting Objectives, reviews the role of performance objectives in planning, implementing, and evaluating instruction. It includes construction guidelines and exercises.

Preparing Lectures focuses upon selecting and organizing content; choosing examples and resources; selecting presentation method; creating conditions for successful learning; and planning to evaluate lecture effectiveness. A one-hour videotape sampling several different lecturing styles is available.

Conducting Discussions addresses the discussion process in regard to patterns, purposes, preparing, conducting, and evaluating discussions. It includes application exercises.

Constructing Multiple-Choice Test Items gives seven rules, together with application exercises, to assist in constructing multiple-choice items in a variety of subject fields.

Constructing True-False Test Items describes simple, complex and compound forms. Rules and exercises guide in the construction and use of true-false items.

Constructing Matching Test Items describes the three components of a well-written matching test-item. It includes methods for test construction and use.

Item Analysis on Objective Tests describes procedures for determining test-item reliability. It includes detailed interpretation of item analysis from a computer print-out.

Constructing and Scoring Essay Questions presents guidelines and exercises for developing and reliably scoring essay-test questions. It explains point-scoring and rating methods.

Performance Testing provides descriptions and construction guidelines for various performance tests. Examples include simulations, work samples, projects, rehearsed performances, and problem solving.

Improving Instructor-Student Relationships discusses these relationships in regard to classroom atmosphere, facilitating communication, instructor functions, student learning-styles, and instructor accessibility to students beyond the classroom.

Developing Opinion, Interest and Attitude Questionnaires gives guidelines for developing adjective and behavior checklists, Likert and semantic-differential rating scales, ranking techniques, and open-ended questions.

Types of Self-Paced Learning Programs describes eight types, including the Self-Instruction Book, Multi-Media Package, PSI Method, and Audio-Tutorial Method in text and tape/filmstrip presentations.

Planning and Preparing Eight Types of Self-Paced Programs outlines step-by-step developmental procedures for each type. It provides guidelines for implementation and program evaluation.

The videotape mentioned above is composed of eight segments. Each segment was produced by videotaping a 50-minute lecture, then reducing it to about seven minutes, showing the main phases of the lecture. Next, the instructor was asked to make pertinent comments about his purposes, techniques, style, concerns, and interests. He also makes an overall appraisal. The responses were dubbed onto the sound track, so that the result is an hour's tape containing eight brief presentations about lecturing.

EVALUATION AND THE FUTURE

The materials described above have been used extensively at San Jose State University and at many of the universities and colleges within the California State University and College System. Further workshops have been conducted in such diverse locations as Princeton and the University of Hawaii. The author, often with his colleague, Dr. Jerrold E. Kemp, has conducted many workshops and has found the module and organizational format to be very effective in starting productive discussions. The workshops often lead to further activities and opportunities for additional consultation or course development.

These materials have been purchased by over 300 institutions. The degree of use and general value, however, is dependent upon many factors, such as the morale of the institution and incentives for professional development. An increasing number of universities are finding the modules useful in training graduate teaching assistants, and many are also using them in medical education. Some impact has been made within industry and government.

A questionnaire (Appendix 1) was sent to the first 200 purchasers of the modules. The responses listed below are a summary from the 45 returns. Most of the materials have been used, and the value of the material was found to be high by the majority of users.

In this review of the move at San Jose State University towards the provision of a faculty self-appraisal and development program, we have described the practical steps taken and the theoretical base used to guide our actions. The assumption has been that we are all ready to improve our professional competencies, whether we are faculty members or are a part of the support services. The model of transformational change depicts a multidimensional approach to change and to readiness for change.

Institutions are usually less flexible and less open to change than are individuals; therefore, it becomes our professional challenge to work within our institutions to initiate procedures which will facilitate rather than inhibit professional growth. Our tasks are at all levels--ranging from helping faculty members to make effective use of media, to helping them improve their instruction, their evaluations and their relationships with students, to helping them design innovative programs.

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APPENDIX

FACULTY DEVELOPMENT MATERIALS QUESTIONNAIRE

The following questions refer to the modular units and audiovisual materials you have received from San Jose State University. Please respond to as many of the questions as you can by checking appropriate answers or adding your own comments.

1. For what purpose did you purchase the materials?

27 general interest
24 specific use with faculty
7 (other)

2. Have you (or someone else in your department or organization) used the materials or made them available to other persons for their use?

Yes	No
36	8

If so, have the materials been used?

20 I (or other persons) have looked them over only casually.
17 I (or other persons) have studied the modules in detail.
(Reading text and completing workbook questions.)
11 I (or another person) have used some or all modules in workshops with faculty.
3 (other)____________________

3. Did you include any of the following audiovisual materials in your purchase?

	Yes	No
Videocassette on sample lecture methods?	8	33
Filmstrip/tape presentations on self-paced learning?	10	30

If so, please comment on the value of these materials:

5 very valuable
18 useful
7 limited value

4. Here's a list of all the modules now being distributed. Place a check mark to the left of each one that you obtained, then for each one that has been used. Please rate its value (1 - low to 3 - high) by circling a number.

		1	2	3
30	Setting Objectives	2	7	10
28	Preparing Lectures	3	7	8
24	Conducting Discussions	3	6	10
31	Constructing Multiple-Choice Test-Items	2	5	14
27	Constructing True/False Test-Items	3	6	12
29	Constructing Matching Test-Items	3	6	9
25	Item Analysis on Objective Tests	2	6	9
27	Constructing and Scoring Essay Questions	2	5	12
23	Performance Testing	2	7	6
21	Improving Instructor-Student Relationships	3	4	7

25	Developing Opinion, Interest and Attitude Questionnaires	5	5	3
17	Types of Self-Paced Learning Programs	1	6	3
17	Planning and Preparing Eight Types of Self-Paced Programs	1	6	3

5. The last pages (yellow) in the workbook for each module provide the user with the opportunity to apply what was learned about the topic. The user is asked to select appropriate subject content and develop an instructional sequence, test questions, or whatever. If the yellow pages were used, were the activities worthwhile additions to studying the content of the module by those who participated?

Yes	No
12	2

6. Do you have any plans to obtain modules you did not purchase or additional copies of those you have found useful?

Yes	No
11	19

Chapter 33

ID in Higher Education: A Paradox

William R. Terrell
Sharon A. Shrock

Many instructional developers in higher education confront difficulties in gaining cooperation in achieving their instructional improvement goals. The difficulties are not usually caused by the people with whom the IDer must interact but rather by the institution itself. In higher education, for example, developers must approach student-centered goals through faculty-centered activities; faculty incentives conflict with teaching responsibilities, and some students have negative attitudes toward the results of instructional improvement activities. This chapter analyzes these problems and poses some answers for the IDers who must deal with them.

The state of the art of instructional development in higher education is perhaps best described as a paradox. Very often it seems that instructional developers are hired to do a job that nobody really wants done. Or, put another way, higher education invests substantial resources for the improvement of instruction and then provides a myriad of diversions which attract faculty attention away from instruction. The purpose of this chapter is to identify some of the elements of this paradox for the instructional developer-in-training and the instructional developer not employed in higher education and to introduce some thoughts regarding actions instructional developers might take to counteract particular elements of this paradox. Included in this paradox are the following: developers must approach their student-centered goals through faculty-centered activities; faculty members perceive their roles as researchers rather than teachers; faculty incentives conflict with teaching responsibilities; the university's commitment to conflicting interests affects instruction; developers often make commitments to faculty needs which conflict with student needs; developers are confronted with the ethical problem of whether to improve what should not be done at all; declining enrollments influence instructional improvement; and some students have negative attitudes toward the results of instructional-improvement activities.

The focus of this chapter is upon major universities as the setting for the paradox facing instructional developers in higher education. Inflation and declining enrollments have so affected the resources available to higher education that only major research universities rich in research grants and in service contracts can make substantial commitments to instructional development. Many small colleges and universities commit their total resources to instruction but even then lack the means to invest in instructional development. Emerging colleges and universities often aspire to a more exalted status and commit their resources to research activities. Excluded from consideration in this chapter are programs that train instructional developers and instructional development activities in professional schools such as the health sciences. Each of these related areas have their own states-of-the-art which merit independent consideration.

The treatment of the paradox of instructional development in the major university is not intended to be hypercritical. The authors view the varied interests and needs of the university with mixed degrees of empathy and frustration. It is the nature of the university to be diverse; it must serve many audiences and purposes. In contrast, it is more in the nature of instructional developers to be very goal-oriented and impatient with anything which distracts from meeting the defined goals.

ID: STUDENT ORIENTED BUT FACULTY CENTERED

The paradoxical nature of instructional development is clearly illustrated in that instructional improvement, a student oriented goal, is only achieved through work toward curriculum revision, course revision, and the improvement of teaching techniques--all faculty-centered strategies. Teaching grants, seminars on teaching techniques, in-class observation, evaluation, and consultant services make up the bulk of the repertoire available to most instructional developers for persuading faculty members to engage in instructional improvement activities. Faculty are completely free in most cases to exercise control over the degree and quantity of their instructional activities. Academic freedom protects them from all but the most cursory scrutiny. Nothing short of outright student rebellion would generate any significant interest from colleagues or from the administration in a professor's instruction. If seems fair to say that faculty members are basically free of any external compulsion to assume the difficult tasks urged on them by instructional developers. Instructional improvement, when it occurs, is a result of the internal compulsion among some faculty members to be good teachers.

FACULTY PERCEPTION OF ROLE

Perhaps the most fundamental dilemma is the difference between the developer's perception and the faculty's perception of the role the professor. While instructional developers view the professor primarily as a teacher, very few faculty members share that view. Most faculty members consider themselves artists, historians, chemists, or engineers, and have never given any real thought to their roles as teachers, or any serious consideration to the nature of the teaching task. Often faculty members accept a position at the university because that is the only organization which provides them the time and resources to engage in research of their own choice. Many faculty members sacrifice significant personal income to gain freedom to research, and often make vital contributions to human understanding and quality of life as a result. Very few faculty members have a genuine appreciation for, or have devoted much energy toward, considering the general education of students. Most expect students to perform as superior scholars in their discipline. Impatient with less-than-outstanding performance, faculty members have considerable difficulty in understanding students who do not share their vital interest in the discipline. In a sense the faculty believe the weeding-out of unsatisfactory scholars to be their most important role as teachers. They frequently are unable to perceive their discipline with the perspective of the student from an outside field. The faculty expect the student to measure-up to the discipline rather than expecting the discipline to contribute to the general educational development of the student. Perhaps the major task of the instructional developer is to persuade faculty members to perceive themselves as educators--each with a role in the total development of the student.

FACULTY INCENTIVES

Probably the most profound dilemma facing the instructional developer in higher education is the conflict between the teaching role of the faculty and the incentive system of the university. Instructional developers try to persuade faculty members to divert significant time and resources from research to instructional improvement activities. The systematic design of instruction requires a major commitment by a faculty member--a commitment far greater than most could justify within their system of priorities. Persons committed to teaching give it first priority and expend whatever energies and resources are necessary to meet student needs effectively. Unfortunately, the incentive system in most universities does not permit faculty members to give teaching first priority. In fact, university incentives are designed to punish faculty members for devoting significant amounts of time to teaching in lieu of research. At some point in each faculty member's career s/he must 'go up' for tenure. At that time the faculty member is evaluated regarding her/his potential for contribution to the university. Prior to tenure evaluation faculty members undergo a probationary period during which they establish a productivity record. The productive faculty member is one who publishes a significant quantity of research and/or generates resources through grants or service contracts. In these times of fierce competition for limited resources universities cannot justify retaining faculty members who do not produce. The probationary professor must demonstrate clearly her/his potential for production or else lose the faculty position.

UNIVERSITY COMMITMENT TO CONFLICTING INTERESTS

A major source of the paradox facing the instructional developer in higher education is the diverse nature of the major research university. There are, perhaps, too many competing forces pulling the university toward conflicting goals. Most universities espouse the philosophy of equal attention to teaching, to research, and to service.

The notion is that research keeps a professor creative and up-to-date and thus improves teaching. Equally important, research permits the faculty to serve the public by adding to the fund of existing knowledge and offering expertise in practical applications in the field. While faculty members have clearly-defined responsibilities for meeting classes, keeping office hours during which to see students, and maintaining quality programs, the university at the same time exerts tremendous pressure on faculty members to enhance the university's reputation by publishing research in her/his field. Most university administrators lust after the fame and fortune accrued by being rated as one of the leading universities in "fill-in-the-blank." National recognition brings not only prestige to the university, but fortune in the form of grants and service contracts. The more sophisticated equipment and facilities, of which universities are so proud, are usually paid for by federal and private grant monies. A substantial number of teaching salaries are very often acquired as a part of a research grant or service contract. A number of graduate students are subsidized through teaching and research assistantships paid for by grants and contracts. Many courses and programs can be offered at the university only because the faculty and facilities were acquired through research grants and/or service contracts. In many universities substantial teaching resources are funded through direct and/or indirect grant support. Instructional developers, faculty developers, media specialists, instructional evaluators, and test and measurement specialists are provided as consultants to aid the faculty in their teaching responsibilities. Faculty are expected to teach well and are provided with substantial instructional resources; however, the incentive system supports professional activities which produce material benefits for the university, rather than instructional improvement activities. High-quality instruction is important to the individual students and to society in general, but high quality instruction rarely pays off with material benefits for the university. There is a direct correlation between faculty research and service activities and grants and contracts which is not evident for teaching activities. Typically the faculty are content with the university incentive system because it rewards them for activities which are congruent with their career goals. Paradoxically, the instructional developer is in the position of threatening the "golden goose" by encouraging faculty members to shift their priorities toward teaching.

FACULTY NEEDS CONFLICT WITH STUDENT NEEDS

Another dilemma of the instructional developer is that s/he is often placed in the position of serving institutional and faculty needs which conflict with the best interests of students. Many faculty members make their first contact with instructional developers when they want help in creating a special convention or workshop presentation or when they must prepare print or nonprint materials required by a service contract. Often faculty members commit themselves to extravagant multi-media programs for professional presentations at national meetings, or to brochures, modules, videotapes, and/or slide-tapes for national circulation under contract to business, industry, or government agencies. Eager to "look their best," faculty members seek the assistance of instructional developers and media specialists in the design and preparation of these projects. The instructional developer is confronted with a multifaceted dilemma: first, these projects are probably very worthwhile in their own right, but they are not intended for classroom use; second, participation in the development of these projects diverts the instructional developer's attention as well as that of the faculty member away from classroom activities; third, scarce institutional resources intended for on-campus instructional purposes are diverted to enhance the personal careers of faculty members. With minimal modification some of these special projects may be used in the classroom. Of course, such "add-on" projects will not benefit students very much if total course revision is actually needed. Instructional developers cooperate with faculty members on these projects in the hope that an avenue of communication will be established which will lead to later instructional improvement activities. It is also hoped that the experience of designing and producing these projects will provide faculty members with instructional development and media utilization skills that they will apply in their regular instructional efforts.

ID: ETHICAL CONSIDERATIONS

Somewhat related to the conflict between serving either student interests or faculty interests is the ethical question of whether to improve an instructional project which should not be done at all. The instructional developer is often called upon to design a specific instructional package with learning outcomes and instructional strategies specified by the professor. In this situation the developer may design an instructional project which is very effective in teaching inappropriate objectives. Sometimes the developer may suspect that thorough problem-analysis would indicate other, more desirable, learning outcomes. Of course, the developer is limited to an attempt to persuade the professor to engage in a more systematic analysis of the problem. Such persuasion is often not effective with faculty members who believe they know the problem and are impatient to achieve a quick solution so that they can go to "more important matters." Firm insistence upon further analysis would more than likely result in the termination of the project by the professor. Ever present is the hope that prolonged contact with faculty members will influence them toward more effective instructional improvement projects.

In effect the instructional developer must choose between participation in the design of inappropriate instruction or the loss of any hope to influence faculty members to participate in effective systematic design of instruction.

DECLINING ENROLLMENTS

Declining enrollments contribute to the dilemma of the instructional developer. Higher educational institutions are typically funded according to the number of students enrolled. A primary instructional responsibility of faculty members is to maintain a sufficient number of students so that all their courses "make." In the past, increasing enrollments have guaranteed sufficient students not only to "make" the courses but to justify the acquiring of additional faculty members and the expansion of facilities. Today's declining enrollments are resulting in greater effort by the faculty to recruit and retain students. In some universities declining enrollments provide instructional developers with the basic elements of an incentive system to attract faculty members to instructional improvement activities. Students with options among multiple sections of courses simply will not enroll in sections taught by faculty members with bad teaching reputations. Faculty members threatened with seriously declining enrollments may be forced to attend more closely to instructional matters. Unfortunately, in some universities the faculty combat declining enrollments by offering new degree programs which are attractive to students. A decline in career opportunities forces many students to pursue advanced degrees rather than face unemployment. Proliferation of advanced degree programs is especially popular among the faculty because these programs carry the prestige of being research-based, and thus are more closely aligned with their personal career goals. Instructional developers, with their focus upon the needs of the student, question the propriety of faculty members protecting their own positions by encouraging students to pursue degrees for which there is very limited hope of future employment. Also, as long as faculty members meet their recruitment responsibilities through offering advanced degrees, there is little incentive to recruit and retain students through the improvement of instruction.

NEGATIVE STUDENT ATTITUDES TOWARD INSTRUCTIONAL IMPROVEMENT

The new instructional developer may find that one of the most baffling dilemmas is that students, the ultimate benefactors, don't always appreciate the results of instructional development. Students are frequently disconcerted by the course-design changes that instructional developers recommend. For example, developers often recommend the adoption of criterion-referenced in place of norm-referenced evaluation of student learning. Also, when appropriate to the learning objectives, developers recommend strategies which require more active student involvement in the instructional events. Finally, developers strive to make changes in the instructional design which will maximize the opportunity for all students to master the course content.

Bright, grade-oriented students are frequently quite content with the norm-referenced grading schemes which still predominate in higher education. These students know that they can 'beat out the pack' in such a competition in virtually every course they take. Even the not-so-bright students who are well back in the fray feel confident that they can do better than at least some of the others--and doing better than only a few is enough to pass most college courses. The point is that none of these students will welcome the instructional developer who threatens to spoil their college years with evaluation schemes that attach grades and "passing" to the demonstration of absolute achievements rather than relative ones. Some students would rather not be informed with clarity about what they do not know and cannot do; they would prefer to remain confident of their place in relation to other students, assured of steady progress toward their degrees as long as the reliable failures among their ranks stay at the rear. After all, in most classes there will be a percentage who are sufficiently distracted, lazy, emotionally disturbed or otherwise confused to ensure success for the others; the others count upon it.

There are also those students who have settled comfortably into the passive student role traditional in most college courses; they have mastered the lecture-text-memorize-repeat process. Systematic analysis and redesign of their courses is likely to disrupt their world in a number of ways. Cognitive goals for the course are sharpened and memorization is supplemented with higher level learning expectations. Instruction via lectures and text alone--or at all--may no longer be appropriate. As a result, teaching strategies might include discussion, audiotutorial, PSI, discovery learning, and/or a host of other variations which require active student response rather than passive absorption. Students perceive this shift as "more work" rather than as "improved instruction." Evaluation--which is very close to the student's heart--is almost certain to change as a result of systematic design. The low-level multiple-choice test or playback essay is replaced by the assessments demanding comprehension (yes, even comprehension questions upset students), application, analysis, and beyond. Out-of-class projects may be required--and the assignments to be re-done until they meet specific standards! While the task-analysis and the strategy-selection components of instructional development often make previously-difficult material easier to learn, the standards of achievement, in terms of the required demonstration of competence, are usually raised as a result of systematic design. As McKeachie (1979) has pointed out, while students are fairly good judges of when they are learning and when they are not, they are not good judges of what they ought to be learning. Consequently, one cannot expect them to greet higher standards with gratitude for a more solid education. Couple the higher standards with a shift to criterion-referenced evaluation--in effect removing the refuge of the curve--and students will very likely be UPSET. Really, from their viewpoint, "Who needs it?!" "Life used to be so simple."

Another small group of students that will be less than delighted with the results of instructional development efforts are those whose academic prowess determines their self-esteem. They are scholastic-athletes. Within reason, these students tend to value instruction to the degree that it is abstruse. As incredible as it may seem, they prefer dull, complex instruction--the further removed from the "real world" and the more difficult to apply, the better. They don't seem to feel that they are "in college" unless learning is tough. Why? because, quite simply, if everything is clear and everybody understands, they aren't recognized as special any more. These students are almost always bright individuals, and the typical college course provides them with lots of strokes. Vague goals, inefficient and inept instruction, and norm-referenced tests guarantee that those high in general ability will be identified as superior every time--the smart kids love it. These students would tend to dislike instructionally-developed courses because the higher-quality instruction allows many more students to perform at the highest levels. And of course, mastery-learning schemes in which many students earn As are the ultimate threat to the scholastic-athletes; their very identity is lost.

Resolution of the dilemmas facing instructional developers in higher education is not at all assured. At stake is the restoration of balance among the teaching, research, and service missions of the university and the survival of instructional development programs. But in a sense, the very existence of instructional development programs is a form of recognition that something is wrong and evidence that there is some commitment to correcting it.

Instructional developers are unique among the groups competing for the limited resources of the university in that developers by definition are commited to the campus-wide instructional mission of the university. Administrators and the faculty, though each is committed to instruction, tend to rank teaching lower in their system of values than other professional interests. Campus administrators are most deeply commited to the promotion and protection of the interests of their particular institutional entities, and the faculty tend to be most deeply commited to achieving professional recognition through research and grant contracting. Instructional developers, in order to promote the improvement of instruction, must assume the task of motivating administrators and the faculty to heighten the value they place upon teaching. It should be noted here that merely heightening the value of teaching may not be enough. There is a tendency among much of the academic community to think of teaching as a blessed gift. Even those who fervently wish to be better teachers may not realize that teaching is amenable to systematic improvement. Developers must increase the perceived value of teaching and encourage the demystification of it.

Typically instructional developers have done very little on a campus-wide basis to affect the motivation of administrators and faculty members regarding instruction. Modest instructional improvement grants, faculty development seminars on teaching techniques, and publicization of services through a newsletter have been sufficient to keep developers busy and provide the illusion of progress toward a campus-wide impact on instruction. However, these activities are static, in the sense that they depend upon a faculty member's predisposition to participate voluntarily. Embarrassingly low student evaluation ratings, hopes that automated instructional innovations will provide more free time for research, and, occasionally, a genuine commitment to teaching excellence provide most of the impetus for faculty participation. If instructional developers hope to resolve the dilemmas they must adopt a more proactive program aimed at motivating faculty members who would not normally place teaching at a priority level sufficient to predispose them toward instructional improvement projects.

Initially the obvious target for developer attention would be reform of the university incentive system. After all, increased rewards for instructional activities would have a dramatic impact upon how faculty members rank teaching in their value system. Further analysis reveals two problems related to concentration upon incentive system reform for the resolution of the dilemmas. First, the faculty members serving on promotion and tenure committees and administrators doling out rewards are not convinced that the incentive system is wrong in its bias towards non-instructional activities. Even if it were possible to mandate incentives for instructional activities, faculty members and administrators would devise means to most highly reward those activities they hold in highest regard. Secondly, formal incentives would result in the adoption of technological innovations easily noted and rewarded by the administration but which may not genuinely reflect a commitment to the importance of teaching (Kozma, 1979). Instructional developers should direct their efforts toward persuading the faculty to perceive an intrinsic system of rewards for teaching activities.

If faculty members value teaching sufficiently they will engage in instructional improvement activities for reasons of personal satisfaction and they will reward colleagues for their teaching activities as well.

Instructional developers must concentrate their efforts, identifying and implementing strategies which will stimulate faculty members to heighten the value of teaching in their system of priorities. One example of such strategy is a campaign to introduce instruction as a campus-wide topic of conversation (Spitzer, 1977). Faculty tend to be too specialized in their professional interests to communicate easily with most colleagues outside of their immediate fields. They, like most other people who do not share mutual interests, communicate about current events they have read or heard about. Topics common to the experience of everyone, such as campus politics, sports, or the economy, form the basis for much of the communication among faculty. Developers could introduce instructional topics into this communication stream by maintaining in campus publications a constant flow of interesting items about teaching. A series of articles centered around in-depth interviews of influential faculty members about instructional methodologies, descriptions of on-campus instructional innovations, and a series introducing divergent faculty opinions on controversial instructional issues are examples of topics that could stimulate faculty discussion with colleagues. Faculty members would tend to value teaching more highly and take a more active interest in developing articulate positions on instructional matters if they noted that influential colleagues were expressing views on these subjects. Faculty members who discuss teaching not only tend to value it more, but would consider instructional issues in terms of their own classes and make more-informed decisions about instructional matters related to their own teaching. They would be more alert to their colleagues' teaching practices and, through expression of their interest, reinforce good teaching. Finally, faculty members would tend to practice themselves what they reward others for doing.

Obviously, the conversation strategy is but one example of a single element in a campus-wide campaign to improve instruction through stimulating the faculty to place a higher value upon teaching. The example was meant to illustrate the notion that the state-of-the-art requires developers to adjust the focus of their efforts. In addition to continuing their good work with faculty members on specific instructional improvement projects, developers must give more attention to campus wide concerns. In a sense, when one considers that the dilemmas facing developers in higher education are a reflection of the imbalance among the teaching, research, and service missions, the authors recommend that instructional developers take on the role of the conscience of the university.

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Chapter 34

Promoting the Liberal Arts and Instructional Development

Robin E. Lawrason

Instructional development has a slightly different flavor within each of the settings within which it is practiced. The present chapter examines the practice of ID within the liberal arts college, analyzing both its problems and its potentials. The usefulness of this to those engaged in ID within liberal arts colleges is obvious. For those of us not in this position, this chapter is also of value, since many of the suggestions and much of the analysis also can be applied to other areas of higher and public education, the health professions, industry and the military.

Higher education is faced with many challenges as it moves into the 1980s. Despite an increasing demand for adult education, many established institutions, particularly liberal arts colleges, have experienced a decline in enrollment and economic stability. The loss of students has not only affected the direct revenues of such colleges and universities, but also has led to the loss of state and federal support in terms of subsidies and priority treatments. The trends away from traditional forms of higher education have serious implications for the growth and develop ment of existing liberal arts programs, and for the instructional development units which serve them.

In the first of a projected series of studies on economic trends in higher education, Minter (1979) examined seven key economic indicators: enrollment, current revenue, employment, capital contract commitments, expendable reserves, voluntary giving and surplus revenues. The first study found that all indicators still show positive trends, but that the strength of these trends has diminished, signalling more difficult times ahead. Many studies done on enrollment projections in higher education support this prediction. Basically, studies show that the number of 18 year-olds who will graduate from high schools will drop drastically in the early 1980s. Centra (1979) predicts an 18% decline over the decade, with 1.7 million fewer students enrolled by 1985.

CHANGES IN STUDENT PROGRAM SELECTION

At the same time that fewer students are attending colleges and universities, fewer students of those who have enrolled are choosing traditional general liberal-arts study programs. A recent study published in The Chronicle of Higher Education (Magarell, 1980) graphically illustrates this change in student program choice over the last ten years. The percentage of both men and women choosing arts and humanities subjects has fallen drastically from 1969 to 1979. Whereas 21.5% of women chose this area of study in 1969, only 12.9% chose it in 1979. The percentage of men choosing arts and humanities dropped from 16.3 to 10.7 during the same period. In contrast, the percentage of women deciding upon business subjects increased from 12.5 to 23.1. There were also small increases in areas such as the sciences, social sciences, and professional fields. The only other field with a significant decline was education.

Magarell notes that overall attitudes, particularly among women, appear to be more career-oriented and of a more practical nature than were the attitudes of students in 1969. Students showed a decline of interest in traditional "liberal arts" values such as developing a philosophy of life, keeping up with politics, getting a general education, becoming more cultured, or meeting interesting people. There was a corresponding rise in the students' interest in career goals such as being financially well off, being recognized by their peers, contributing to scientific theory, an becoming and authority in their field.

It would appear that today's college student is seeking practical and useful skills from her or his education beyond high school. As a result, liberal arts programs within higher education are loosing out to professional schools such as business, communications, engineering, health sciences, law, and social administration in attracting the declining student population. The greatest challenge for the liberal arts in continuing their important role, however, is not from competition from others within formal higher education. Adult education is now being provided for a wide variety of non-traditional learners by churches, corporations, cultural institutions, industries, social agencies, and unions.

CHANGES IN STUDENT POPULATIONS

At a time when the number of 18 year-old high school graduates is diminishing, there is an increasing growth in the number of adult Americans who are seeking some kind of learning experience. In a special issue of Change magazine, "Education and work," Bonham (1979) estimates that, while 60 million people are in some form of instructional setting, 46 million of those are outside our formal school and college system. He also notes that the need for adult learning is equally impressive, with 65 million Americans lacking basic competency skills, 15 million more lacking college degrees, and 12 million more requiring some form of in-service education. In order to survive, Bonham challenges academic institutions to use "the best human imagination, new communication technologies, and high institutional courage" to meet the needs for adult learning and renewal.

In the same issue of Change, Bolles (1979) reports that 83% of those adults who are looking for further learning experiences were triggered by either voluntary or enforced career changes. According to a College Board study cited by Bolles, 40 million Americans are experiencing some sort of transition in their lives as workers. He notes, however, that 60% of the instruction related to career transition is provided by the military, by industry, and by unions. Higher education must then consider what it can do to further the worker's development. Bolles suggests continued efforts through remedial and vocational courses and career services, but more importantly, more attention to specific functional skills, self management, and the use of self-directed materials. He warns, however, that program changes are not enough; institutions must redefine their own mission first.

Similarly, Bengtsson (1979) challenges higher education to respond to the impact of new technologies upon people in the workplace. While the new technologies require fewer people to produce them, they require more people to apply them in useful and creative ways. The question remains whether traditional educational institutions will pick up this challenge, or whether we will see the development of a new private educational sector. Koontz (1979) is more optimistic and argues that only the university has "the visibility, the credentials and the access to the media that will be necessary to make the worker's education a serious topic of concern." She argues that the universities, through their specialized faculties, could provide the programs and services for adequately dealing with the worker's concern.

THE LIBERAL ARTS AND NEW TECHNOLOGIES

Can the liberal arts, our traditional source for the study of the humanities and social sciences, utilize new technologies to reach those new learners, define their needs, and assist them in coping with changes in their work and in society? Many liberal arts faculties have been uncomfortable with technology and have decried its encroachments upon personal liberty, human dignity, and intellectual growth. While many have not been reluctant to use high-speed computers to collect and process their research data, fewer have been able to apply any of the available technologies to their teaching. Instructional development (ID), a technology for improving instruction, has been active in higher education over the last 20 years. At a time of rapid change, within the liberal arts particularly, it would seem that ID should be examined further by those who are looking for ways in which to respond to the demands of new learners and new objectives.

THE LIBERAL ARTS AND INSTRUCTIONAL DEVELOPMENT

Even when enrollments and resources were abundant, instructional development was never easy to promote in many areas of higher education. Especially in the liberal arts areas, faculties have long been suspicious of professional educators with their jargon, technology, fads, formulae, and most of all with their many failures. Traditionally, few liberal arts colleges have been able to provide those factors that most developers cite as being essential to successful ID: faculty incentives, administrative support, faculty involvement, creative and politically-placed project directors, and effective support services (e.g., Lawrason and

Hedberg, 1978-79).

After over 20 years, instructional development seems to have had little impact upon liberal arts education. Many institutions of higher education do not even have ID services. Liebler (1978-79) reports that only 46 out of the 130 institutions in the Illinois region had an ID faculty. Gustafson (1978) deplores the lack of a solid theoretical base for ID, and paints a rather gloomy future for the field in higher education. He questions whether many in the profession really do ID. He asks how many well-documented cases there are, and whether those that do exist are relevant to ID in higher education, or are effective in promoting ID. Thus it is perhaps not surprising that liberal arts colleges have been reluctant to utilize these or other new and unproven technologies in their teaching.

In addition, the existing highly volatile organization of most liberal arts faculties makes it difficult to implement significant changes in instructional programs. In an atmosphere in which the academic independence of the individual professor is protected, and in which departments regularly rotate administrative and committee duties, it is difficult and time-consuming to maintain communication and to develop consistent and informed policies or procedures. ID will continue to have little success in higher education unless significant changes occur in institutional mission, in faculty attitudes toward the use of technology to improve teaching, and in political structures to implement change fairly and reasonably.

POTENTIAL FOR ID IN THE LIBERAL ARTS

With the beginning of the eighties, there are indications that changes are already occurring within some liberal arts colleges. These changes have great potential, not only for regenerating liberal arts curricula and leadership in post-secondary education, but also for providing new opportunities for instructional development.

"Back to the basics" has been a popular cry for the last few years. It is slowly becoming clear that teaching the basics is no simple task for educators in post-secondary institutions. Only recently have English and math teachers realized that they require more assistance from a variety of resources, including instructional development, if they are to make progress in conquering the learning deficiencies of entering freshmen.

Without recounting here the numerous reasons, it is sufficient to say that most colleges and universities have had to establish programs to teach the basics of reading, writing, math, and study skills. Whether or not such students should be admitted in the first place will continue to be debated. The fact is that they have been admitted and they require help if they are to make progress in any degree program. The attrition problem in many institutions is often related to the failure of students who lack the basic skills needed to make headway in remedial-type programs. Colleges in this era of declining enrollments cannot afford to lose these students if there is a chance that they can be brought up to passing standards.

By-and-large it has been the liberal arts faculties who have been faced with the task of providing basic-skills programs. Tremendous effort and expense have gone into such programs. Not only are faculty members burdened with the tremendous task of setting up remedial programs for increasing numbers of students, they are also discovering that their traditional methods and materials are only partially successful. Despite their efforts, there are many students who seem to get stuck or lost in these large programs and keep repeating them without making progress. Program directors once simply assigned graduate assistants or "spare" faculty members to the teaching of standard grammar or of writing skills in standard classroom fashion. They are now beginning to realize that this traditional approach is no longer adequate for solving the numerous kinds of problems faced by the many different kinds of individuals who are placed in these programs. The old "sink or swim" laissez-faire philosophy is costly, not only in terms of individuals it condemns to ignorance, but also in terms of the student enrollment fees lost.

Those institutions that have decided to assist students with skill deficiencies, whether for altruistic or for economic reasons, have begun to develop procedures which will help to retain such students by dealing with individual student needs. On the surface, a lack of ability to organize and write thoughts seems to be simply a lack of basic writing skills. Poor diction, punctuation, grammar, or organization, however, may also be an indicator of motivational, emotional, intellectual, or cultural difficulties, or may even be a symptom of a learning disability. Only through the use of better assessment techniques and instruments can these differences or specific problems be identified and diagnosed. Once diagnosed, the task of prescribing the appropriate "treatment" for the individual student is much easier.

Instructional development skills, along with those of educational research and measurement, are needed in order to correct many of the problems involved with providing the right "basic skills" for the right person. ID specialists can serve as a valuable resource to basic-skills faculty members by helping them to specify content and objectives, in selecting appropriate learning strategies and in developing various learning resources. In particular, their knowledge of the latest developments in self-study, media utilization, and computer technology will be indispensable to faculty members charged with providing the variety of individualized materials and processes needed to remedy the numerous specific skill deficiencies which more precise assessment instruments indicate should be provided for students.

A second hopeful trend in the liberal arts is the move away from rigid specialization in specific academic disciplines towards a conceptual or thematic focus. Faculty members from various disciplines have formed alliances to study such topics as American studies, Black studies, women's studies, urban studies, etc. Here, specialists from the traditional disciplines band together to investigate a problem or an area of common interest, but each from her or his own viewpoint: art, language, history, anthropology, sociology, geography, psychology, etc.

Faculty members who have broken out of molds of subject-disciplines have often proven able to break out of old molds of teaching approaches. Interdisciplinary methods for approaching an area of inquiry often demand the visualization of concepts through films, slides, and other media. In order to develop a commonly agreed-upon curriculum, faculty members are faced with the need for cooperative discussion and for planning to a degree which was never required when they used traditional approaches, in which each scholar basically worked alone. With this ground-work of shared specialities and cooperative planning, the role of the instructional developer can more easily be introduced. In an atmosphere already accepting of others' expertise, the ID professional can more easily contribute her/his own experiences and skills.

A third trend in liberal arts curricula may also improve the future outlook for the expert in instructional development. In reaction to the demand for open and "relevant" curricula during the sixties, many institutions eventually did away with all course requirements and allowed students free choice to pick desired options. After a decade of this open approach, educators began to note that students had a few common educational experiences, and many lacked even a rudimentary awareness of their own or any other intellectual heritage. As the eighties begin, this trend has reversed, and many institutions are returning to basic requirements. The re-implementation of old program requirements presents another possibility for meaningful assistance by those with ID skills.

Harvard University began in the mid-seventies to debate and develop new core requirements (Wilson, 1978). There was a surprising unanimity among faculty members and departments concerning what those requirements should be. Despite fears by those departments not involved, the consensus was strongly in favor of a general education approach. Wilson notes that Harvard is still in the beginning of their efforts to revitalize general education, and that "ultimately everything depends upon the existence of good teachers." The focus upon the faculty member as teacher is vital to the concerns of the instructional developer. Faculty members will require greater resources to help them develop and grow as teachers of today's students than they did in the past.

The new core curriculum, moreover, does not necessarily mean a need to return to the old "Chinese menu" type of undergraduate program. Some institutions have attempted to rethink the entire approach to the subject matter and to use new curricular approaches. Temple University, for example, has had long and positive experience with interdisciplinary approaches. Recognizing the need to provide a common educational experience for students, the Temple liberal arts faculty has developed an Intellectual Heritage "core curriculum". The "core curriculum" will be developed and taught jointly by faculty members drawn from such departments as anthropology, English, foreign languages, history, philosophy, religion, political science, sociology, and speech.

This innovative approach breaks traditional patterns of faculty/student interaction and provides an excellent opportunity for the instructional development staff of the unversity to offer assistance at all levels of program planning and implementation. Course organizers have already indicated a desire to utilize visual formats to demonstrate the various cultures to be reviewed in the course. One problem in teaching the course will be the necessity for highly specialized faculty members to present and discuss information from outside of their own fields. By using audiotapes, slides, videotapes or print materials prepared by colleagues, the faculty and students can gain access to a wide variety of specialized information and thought from their various colleagues throughout the college. The college's learning center has the staff and facilities for assisting the "core" faculty in the development and implementation of their program, both in the classrooms and in self-study areas.

The fourth factor that has the potential to increase the demand for specialists in instructional development in the eighties is the increased availability of complex technological delivery systems. It has become almost axiomatic in any discussion of instructional technology over the last 30 years to mention the fantastic speed with which the current electronics revolution has occurred. The "golden age" of the teaching machine was forecast even as far back as the early part of this century. As the eighties begin, however, the realization of this long-awaited instructional capability is upon us. The miniaturization of electronic circuitry and the use of laser technology has reduced the size and cost of computer and video systems while increasing their speed and capacities. With cost and size problems being remedied rapidly, we will undoubtedly have a relatively inexpensive technology to randomly access verbal and visual information almost instantaneously.

The major problem with this growth, as it has been throughout this century, is that the technical sophistication of such advancements far exceeds our abilities to apply and utilize this hardware for providing meaningful educational experiences. Those involved in the design and development of instruction have a responsibility, first to be aware of these advances, and second to translate them into a form which is usable by their faculties.

The new hardware can provide students with new potential for obtaining a wider variety of information, for interacting actively in problem-solving exercises, and for designing their own learning profiles based upon their skills, abilities, and interests. This new technology, however, demands planning and design at a level of precision not usually practiced by those faculty members who are still using traditional teaching strategies. Learning objectives need to be specified clearly; levels of ability determined; tests developed; exercises created at various ability levels; and resource materials located, sorted by knowledge levels, and converted into formats compatible with desired instructional methods and resources. This level of planning, production, and testing is clearly beyond the capacity of the average faculty member, either because of the variety of new skills required, or the time it would take to complete such rigorous tasks. If new technologies are to be integrated into traditional curricula and institutions, then ID skills will most certainly be required, along with those of the teacher, the evaluator, and the resource specialist. Exotic hardware technologies are useless to those in higher education without accompanying procedural technologies. ID is a technology of analysis and design which can aid human decision-making. ID professionals thus can assist teachers in applying and utilizing those aspects of new hardware technology which have the potential either to save time or energy, or to open new educational experiences not possible through any other means.

It is becoming increasingly clear that scholars in the liberal arts cannot ignore the fact that we are in the midst of a revolution in communications and learning technology. While the primary resource of most academics remains the printed page, they cannot deny that other forms, such as television, radio, telephones, and the computer are the major communication media for the average person today. It is now fact, not prediction, that within this decade even the familiar Library of Congress card catalog will disappear as all library reference systems convert to on-line terminals. Thus, those in the liberal arts need to continue and intensify their study of the application of these new technologies to human issues. But thus far it has been communication corporations, industry, the military, and government agencies who have taken the lead in developing complex new technologies for communications and training.

One hopeful sign that a theoretical base is beginning to be developed around elements of the new technologies is seen in the growing interest in concepts such as "computer literacy", "film literacy", and "visual literacy." New theories are emerging which attempt to inform people about the structures, the characteristics, and the positive and/or negative effects that these new inventions have upon human communication. Many of these approaches have come from faculty members in liberal arts disciplines. Interaction among those who develop these critical theories, those who develop the technologies, and those who design and develop instruction is essential in order to communicate problems and concerns and to exchange ideas on how these new technological developments can positively affect human communication and learning.

Moreover, it has been the task of many humanities scholars to monitor advances in science and technology in order to study their ethical and social implications. The scientific community has been reminded dramatically of the need for such monitoring throughout the present century as humans have developed the potential technology to destroy the earth or even to create artificial life. A variety of scholars from the biological sciences, the physical sciences, the social sciences, and the humanities must examine each new discovery carefully. A balance of input is needed to ensure that our new knowledge does not compromise the dignity of the human spirit simply for the sake of science or greater efficiency. Science and technology can provide us with many of the answers to current dilemmas and can vastly increase human potential; yet without thought from our collective body of scholars, we take greater risks in applying that knowledge.

The increasing cooperation and concern between the arts and the sciences is perhaps best seen within liberal arts colleges, where such communication continues through the interaction of scholars within a single institution. Thus, the liberal arts scholar has been placed in a unique position for assisting young learners in understanding the concerns, relationships, and conflicts between technology and human life. The instructional developer working within a liberal arts college must, first, be aware of and support fully this unique educational mission of the institution. Second, the ID professional should seek to continue the dialogue with her or his academic colleagues, exploring the potential of instructional technology for furthering the teaching and learning goals of the college, and examining the ethical and social implications of using this technology to do so.

SUGGESTIONS FOR THE INSTRUCTIONAL DEVELOPER IN LIBERAL ARTS

The institutional developer anywhere must know his craft well and must be aware of new developments within it. The IDer who operates in the liberal arts, however, cannot overlook the importance of her or his own interpersonal skills. Terrell (1979) relates the value of "soft sell" interpersonal skills in the success of ID projects at her or his institution. Thus it is suggested that the IDer interested in promoting ID within the liberal arts base her or his approach upon interpersonal strategies, rather than upon strategies derived from the development process itself. A number of recommended strategies are presented below.

1. Promote the Liberal Arts Concept

There are a number of steps necessary for an instructional developer to take in promoting ID within liberal arts. The first step is to be an active supporter of the liberal arts. It is essential that the overall public, the potential student client, and administrators and faculty members in other colleges fully understand the mission, goals, and values of a liberal arts education. Every effort must be made to demonstrate to these groups that the liberal arts have always been concerned with the central issues of human life and existence as these issues have manifested themselves in the past, the present, and the future. Continual emphasis upon career education and professional training has recently done disservice to the liberal arts. Such training is essential, and is certainly the task of colleges as well as of industry; however, it must not be accomplished by sacrificing basic education in how to read, write, and think both competently and creatively. The liberal arts curriculum still remains the best educator in these areas. Only through interacting with the depth and variety of academic expertise in the arts, humanities, sciences, and social sciences which is available in a liberal arts institution can a human being develop the perspective and creativity required for her or him to successfully deal with the complexity of today's issues.

The role of the liberal arts in relation to the workplace must be recognized in a period when so much emphasis is being placed upon professional training. Jacobs and Phillips (1979) provide an excellent review of the history of higher education and the role of the liberal arts in America. They charge that traditional programs cannot provide the vocational training required to keep our nation and its economy strong. They argue, however, that only through the pursuit of two goals, first, the spread of literacy and knowledge, and second, the building of economic strength, can the relationship between education and workplace become complementary again.

Gomberg (1979), moreover, is skeptical of the claim that industry can provide its employees with an adequate general education. He states that "the freedom that successful worker education demands is constantly threatened by the self-interested objectives of the institution sponsoring and paying for the worker's educational eperience." He cites an example of a company that provided for its executives to take humanities courses at a local university. The company discontinued this practice when employees became more interested in the humanities than in their management concerns. It is clear that colleges and universities not only have superior resources, but also have a more objective viewpoint from which to teach than does either management or unions.

For many, it may be necessary first to demonstrate the value of a liberal arts education. Winter, et al. (1978), argue that the 2000 year-old contention that a liberal arts education is the best preparation for life should be tested empirically. Their study utilized operant tests in which subjects were required to operate upon material and develop their own answers rather than simply respond to pre-determined choices. Subjects were tested from three schools: a prestigious liberal arts college within a university, a four-year teacher education college, and a two-year community college. Students enrolled in the liberal arts program consistently showed significantly greater gains than did students in the other programs on the measures used in the study. The results of this study may be questioned, since the three student groups were drawn from three schools whose entrance criteria and program length differed greatly. Nevertheless, the concepts of testing the effects of a liberal arts education is a sound one and should be explored further.

ID specialists should support efforts to evaluate the effects of liberal arts programs and to publicize the results of such evaluations. First, through the validation of measures such as those developed in the Winter, et al., study, a valuable tool can be produced for use in comparing the effects upon students of a liberal arts program with the effects of a professional or career-oriented program, or with those of a less rigorous two-year program. Such measures may indeed be needed to show prospective employers that what liberal arts graduates may lack in specific job-related skills, they more than make up for in their ability to both reason and communicate more effectively than can graduates from other schools.

Second, the evaluation of the effects of a liberal arts program upon students is a necessary antecedent to a demonstration of the effects of ID upon liberal arts. Only when support of the liberal arts as a pivotal educational experience has been won, will ID, in turn, win the opportunity to prove that it can have a significant effect upon improving the effectiveness of the liberal arts program.

The ID professional, moreover, can be a valuable resource to colleges in assisting them with the promotion of both the liberal arts philosophy of education and innovative programs within the college. Publicity and public relations have long been held suspect by many in the liberal arts, but competition on campus between courses and departments has already lead to much internal advertising of courses and programs. Also, colleges are beginning to conduct more aggressive external recruitment campaigns using feeder schools and community groups, and are also competing for students through messages in the mass media. The IDer should help administrators in these efforts. First, ID skills might be used to assist the college in defining its missions and goals more clearly. Second, the ID specialist can assist administrators in their recruitment efforts by providing them with a thorough analysis of such potential students as high school graduates, working professionals, and retired persons. Third, the IDer, with the help of media specialists, can work with administrators to develop presentations which can get the college's message across to the general public and to potential new students, as well as to colleagues in other professional schools within the university.

It is essential, therefore, that liberal arts colleges be able to demonstrate that their programs provide a superior education for a wide variety of students, and that they can grow and adapt in response to legitimate new educational needs of society. Only through such demonstrations can public support for liberal arts programs, as measured in continued enrollments, be expected to increase. And only under such conditions will instructional development be given the opportunity to demonstrate that it can have a positive effect upon the quality of the liberal arts program.

2. Work with Curriculum Committees

Instructional development specialists in liberal arts colleges should be represented on curriculum committees as new programs are designed and planned. In many colleges the person responsible for providing ID services to the faculty sits, sometimes in ex officio capacity, on such committees. This contact is essential in order to permit this person to exchange information with departments planning new or revised offerings and to act as a consultant on educational techniques. Only with this input to department or college planning groups, can the IDer have the opportunity to suggest alternatives, cite research results on similar projects, or assist the faculty in the initial stages of design: analysis of learners, problems, objectives, and needs.

In too many instances, the instructional developer is consulted only after the course content, methodology, and even administrative implementation has already been established. The instructional developer is then only able to assist at the level of media program development. Wider ranges of alternatives in teaching-learning styles, evaluation, and assessment procedures have been eliminated from consideration by this time, and ID is applicable only to the design of individual units or lessons within the predetermined course structure. It is important, of course, not to loose this opportunity to become involved, even at this stage. But future contact at earlier stages is possible once faculty members have the opportunity to learn what services are available and have become more comfortable working with their ID colleague.

It is important, however, that the developer be a meaningful resource person who begins her or his responsibilities at the beginning of course planning. With the complexity of new course approaches being considered today, the ID specialist should be recognized as an essential team member along with faculty content specialists, evaluation specialists, and even research specialists. If it is not politically or administratively feasible for the ID person to become an official member of curriculum committees, it is essential that s/he do all that is possible to offer assistance to both departmental and college-level committees. Interpersonal communication with committee members is especially useful in keeping in touch directly and indirectly with new projects in the college.

3. Work with Faculty Development Programs

Another area in which direct or indirect involvement should be a priority for IDers is the area of faculty development. Many colleges have begun to develop their own programs or resources for faculty development. Again, the ID specialist should be a resource on committees or should function as a consultant on course improvement projects and faculty development workshops.

Sometimes, a college prefers to promote faculty development efforts more indirectly. More success is often achieved if such efforts are part of a larger project. For example, if faculty members are recruited for a new curriculum project which differs from traditional teaching, there are always excellent opportunities to "build in" faculty development. Workshops can be given to acquaint new faculty members with the new procedures and methods. Those projects which use teams of teachers, perhaps even interdisciplinary teams, also have a large potential for such indirect faculty development. Faculty members get an opportunity to work together and to see novel teaching methods, styles, and approaches. The interaction and discussion between faculty members as they share their teaching experiences can be a valuable source of "faculty development." Such efforts can be even more profitable if the ID specialist is able to work with faculty teams as an additional resource.

While faculty development (FD) is concerned with issues beyond instruction alone, there are many overlaps in the purposes and methods between ID and FD programs. The IDer thus must work closely with those faculty members and administrators most concerned with and involved in efforts to assist the college faculty in improving their teaching potential. It may be necessary, however, to keep a low profile in this area. Some faculty members, usually the ones that most require help, may resent the suggestion that they need "development." Again, interpersonal contact with leaders can provide discrete opportunities for IDers to serve as a resource on projects without threatening or embarassing any of the teaching faculty.

4. Work with Other College Change-Agents

Within most colleges there are various faculty members and administrators who are actively attempting to introduce innovations into the teaching, research, or administrative functions of their institution. Such innovators, or change agents, should be the natural allies of the instructional developer. The task of the IDer is to promote and develop changes in the instructional process. Often this can be a lonely and isolating role, particularly where faculty members are resistant to any change in time-honored routines or approaches. Thus, it is important for the IDer to search out colleagues who are fighting similar battles, whether they are involved in the design of new college courses, changes in the administrative organization, development of new curricular program offerings, or the revamping of a single course.

This alliance with other change agents within the college is important for three reasons. First, there is need for comaraderie among those who see constructive change as a vital and necessary task in the struggle for economic and philosophical survival of the liberal arts within higher education. Often such change agents are highly individualistic people who work long hours to see their projects completed. Too often the obstacles they face daily in cutting through the bureaucracy of the many committees, higher-level administrators, and service units is a frustrating experience. Some change agents inevitably become embittered by the process. Others become so narrowly focussed upon their own project that they lose their perspective with respect to the college's overall goals or other projects that may even be related to their own. The ID specialist is not immune to such bitterness or narrow focus, and should seek out others in his college in order to share problems, frustrations, and successes. More importantly, the IDer must not be isolated from other innovative people and projects throughout the college if s/he wishes to maintain her or his own perspective.

Second, the ID specialist is often in a unique position to provide an overview of what is going on throughout the college. Thus, s/he could serve both as an important linkage person between various change agents and as a resource person to them. With close communication with the individuals involved in new programs, the IDer can help colleagues by informing them of important contacts in other departments or service units. This is a useful function, especially on large campuses where faculty members in some departments may even be unfamiliar with some of the members of their own departments. Knowing the strengths of the human resources within the college is an essential role for an ID specialist. Furthermore, close contact with project directors, whether formally or informally, also allows the IDer to provide input to them concerning the nature of ID services that are available. Project writers should already be aware of such services, and the ID staff should already be included as resources within new curricular or instructional projects. However, often a project is underway before it staff realize the need for a better definition of goals, subject-content analysis, selection of teaching and learning alternatives, evaluative procedures, or other components of the development process. While this is a regrettable situation and might be considered back-door ID, if the IDer has been close enough to the project's staff to recognize their unanticipated problems, s/he will be in a better position to suggest the use of ID skills and resources to assist the project that is already underway.

The third, and most important, reason that the IDer should seek out other change agents and support change within the college is that without change in faculty attitudes there will be no instructional improvement or ID success. Nalbone (1979) suggests the use of simulations in faculty workshops to identify or define problems, generate solutions, select actions, and begin implementation. Such simulation experiences, he contends, could improve the faculty's "cognitive map" of the instructional process and lead to more successful ID experiences. Any support the IDer can give to those who seek more emphasis upon instruction within the institution should be given. Whether these efforts are in the form of professional workshops or of committee actions to change policies the ID specialist must do all s/he can to assist and support such needed change.

5. Promote and Support Funding Opportunities

Another important activity for the ID specialist is to keep in contact with research-and-development officers within the institution. A number of federal and private funding agencies fund projects which include instructional development activities. IDers should get to know contacts having funding information on campus, and when possible, in the agencies themselves. It is important to be able to identify funding sources for topics or problems which are priorities within the college and which require the development of instructional strategies and materials. Similarly, the IDer should also keep in mind the interests, strengths, and priorities of college faculty members and departments. Information can thus be relayed to faculty members so as to promote interest in new projects aimed at developing new instructional strategies.

Close contact with other college change agents, as mentioned before, can give the IDer entry into funding projects first initiated by individual departments. Often faculty members are unaware of how ID services can assist in both the writing of the proposal and in the implementation of the project. Good communication with departments as well as with reviewers of such proposals within the college can give the ID service the needed input in such proposals.

It is becoming more and more difficult for colleges to finance large instructional projects involving meaningful change in traditional instructional practices without external funding support. The design, planning, and production of resources which are needed to effect such change is costly in terms of faculty and staff time, as well as in materials. External grants are thus the only opportunity many colleges have to employ full-scale ID. There are certain advantages to this approach, beyond the obvious monetary ones, for the resident IDer.

Outside funding sources often place criteria upon a project which are more rigorous than those envisioned by the originating faculty members. To win funding, faculty must develop a truly innovative approach to the solution of a significant problem. This "stretching" of imagination often leads to creative solutions not previously tried within the college. Also, such projects demand a level of design, planning, interdepartmental team work, and evaluation of results not often attempted within existing academic settings. Such external criteria often make the work of the ID specialist much easier. It is the agency which sets the criteria, not the IDer. Thus, the IDer may operate more freely as a colleague of the content specialists without being cast in the role of task master.

In looking for funding opportunities it is necessary to keep in touch with the funding priorities and guidelines of specific agencies. Priorities shift over the years as new problems are addressed. Currently, there continues to be a strong interest in minority educational opportunities. New guidelines give priority to projects aiding various Hispanic groups, Native Americans, and new Asian refugees, as well as Blacks. The recent changes in laws for the handicapped have lead to new grants aimed at "mainstreaming" disabled people into regular programs within all institutions. Other formerly neglected groups for which funding has become available include women, the gifted, the aged, and adult learners.

Funding agencies also often have priorities in terms of new curricular or instructional content or approaches. Over the last decade there has been an ever-growing need for providing instruction in the basic skills, both in language and in mathematics. This need appears to be continuing into the eighties with more than 50% of entering students failing basic competency tests in many institutions. New methods and more research is obviously required to solve this problem at the college level. Along with language and learning evaluation specialists, the ID specialist must be employed to develop and implement projects to assist students in achieving these basic skills.

Another curriculum priority in which the IDer should become involved is the renewed interest in providing students with a core curriculum. During the permissive sixties requirements for coursework were largely eliminated. By the late seventies, colleges began reversing the trend and requiring new general-studies courses. Some agencies have now made funds available for innovative approaches that can give students a better grasp of the range of historical, cultural, social, and scientific knowledge which has been developed throughout our world.

Other agencies stress the use of new strategies or resources in their funding priorities. The National Science Foundation, for example, is looking for application of new technologies such as the computer, lasers, the videodisc and satellite television communication to solve instructional problems in the teaching of math and the sciences. Often such agencies are anxious to fund projects which develop modular units or individual learning packages that can be used beyond the developing institution. The portability of these units is becoming more of a critical factor since the development of instructional materials using such technologies has very high initial costs. The tradeoff for such projects, however, is that once developed, they are easily transportable at lower costs.

The Fund for the Improvement of Post-Secondary Education, as its name implies, looks for projects to assist faculties in implementing change within their institutions. Such faculty development grants are another important area of concern for the IDer. Osterman (1979) and Klein and Doughty (1980) describe the results of two F.I.P.S.E. grants in promoting ID activities in their own institutions. Any activity which brings in outside consultants and provides workshops, discussions, and training for improving teaching and learning activities can assist the ID specialist in her or his role with the faculty. Involvement in such projects also provides visability for the IDer and gives her or him future access to faculty members who are motivated to make changes in their instructional planning as a result of such faculty development projects.

CONCLUSIONS

Unless liberal arts instructors can adapt and develop their rich reserve of knowledge by utilizing the numerous technologies that are now at their disposal, they will lose their preeminence within higher education during the next ten years. Use of technology by the liberal arts need not threaten the basic content of our intellectual heritage as it has been defined and redefined over the years. Nor must technology necessarily dehumanize our human spirit and understanding. Change is not so much needed in the basic content of a liberal arts education; the changes that are most needed relate to approaches to that content, as well as to the methods by which that content is communicated to learners. Instructional development is a technology, but it can be a humanistic one that is based upon reasoned cosideration of all types of resources: human, print, media, and machines. Its function is to find the best mix of resources for reaching a stated educational goal. This requires pulling together scholars from many areas: subject content, learning theory, instructional design, media and communications, and assessment, among others. Using this team approach allows a dialogue to occur where only one person might have been involved in a traditional situation. Any technology that can allow for more human consideration and ultimately create added diversity in resources and choices must be more humanistic and rational than any approach that must rely upon the wisdom of one isolated specialist.

If the liberal arts faculty cannot utilize their many skills and apply them to the problems and educational needs of a developing society, then these issues will be resolved by others. The private sector will continue to provide for its workers, its consumers, its neighbors, and all those adults who actively seek further learning experiences. Both the liberal arts and those instructional developers who serve them are in a unique position to address these needs, if they choose to overcome old stereotypes and obstacles to cooperation.

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VI. APPLICATIONS

This section of the book examines the state of instructional development in the real world. This is not to say that previous chapters did not address the real world, but these chapters specifically do so. Six chapters examine the practice of instructional development in four different settings.

The first two chapters examine the practice of instructional development outside the United States. Chapter 35 provides guidance for the developer from the United States who wants to work abroad. Chapter 36 describes how instructional technology is practiced in the Soviet Union.

The next two chapters discuss how instructional development is currently practiced in the military environments. They also discuss, to a limited degree, its history and success in this environment. Chapter 37 concentrates primarily upon the Navy, while Chapter 38 concentrates primarily upon the Air Force.

Chapter 39 discusses instructional development within private industry.

And the final chapter of this section, Chapter 40, discusses instructional development within the public schools.

Each of these chapters is important to the overall picture of instructional development, for two reasons. First, those working in one of these environments seldom has close contact with developments occurring in the others, or in academia. Second, if instructional development is to survive, a larger percentage of university graduates of developer training programs are going to have to find jobs in these environments. This is both because of limited number of available positions in universities, and because these are places where training is going to occur on a wide scale, whether or not anyone is available who knows the best way to conduct it. Clearly, if this is so, then university training courses must be modified to meet the needs of these environments. To so change the curricula, a knowledge of training development in these environments is necessary.

A. International

35. Some Pointers on Instructional Development in the International Arena. John H. Austin and Amy A. Titus.
36. Innovation on Command: Instructional Development and Educational Technology in the Soviet Union. Stephen T. Kerr.

B. Military

37. Educational Technology in Military Training Applications: A Current Assessment. William A. Platt and Dee H. Andrews.
38. Instructional Systems Development in the U.S. Air Force. Hilton D. Goldman.

C. Industry

39. Industry and Instructional Development. Clint Wallington.

D. Public Schools

40. ID and LMS: Past, Present, Future. Phillip Michael Turner.

A. INTERNATIONAL

Chapter 35

Some Pointers on Instructional Development in the International Arena

John H. Austin
Amy A. Titus

Instructional development, of course, is going on all over the world. Some countries are able to do their own development, others lack the capability and these look to consultants for assistance. This chapter provides insights into the miriad of considerations which one must make if he/she intends to function as an IDer in the international arena. Contact offices for several international organizations having needs for instructional development is also reported.

During the last decade, third-world countries have made significant steps in bringing a higher quality of life to their people. This progress has introduced new technology and management systems in most cases, thus, new instructional development efforts are called for. Many of the developing countries have adopted the traditional educational approaches of the countries which formerly governed them. These approaches usually provide a strong academic background but often do not produce skilled technicians and decision-makers for an improved quality of life.

In recent years funding groups, such as many UN organizations, international banking organizations, and donor nations, have found neither capital investment nor infrastructure development have been as successful as they might be, because of deficiencies in the operation and maintenance of the systems or in the organizations managing them. These funding organizations are implementing new strategies which place much greater emphasis upon training components. Thus, it appears that there will be a demand for instructional development efforts in many challenging situations.

Instructional development in a developing country must speak to the real need for producing personnel who are not only capable of doing their jobs, but who are also effective promoters of techniques such as performance technology and the systematic design of instruction. Meeting this need enables the learners to support and maintain a system that evaluates and upgrades their own and other employees' work performances. An organization or system which provides such training has a greater chance for successfully providing reliable services or products over time.

In the international arena, the instructional technologist is designing and developing for immediate and long-range needs. The first section of this chapter will examine the major types of organizations which require such services, how to prepare for employment in them and important considerations which influence the way in which instructional development occurs in them. In the second section, a case-study is presented in order to give an indication of what the instructional technologist/trainer may encounter in the international arena. The third section examines the rewards available from these activities and summarizes the chapter.

ORGANIZATIONS USING INTERNATIONAL CONSULTANTS[1]

There are four major types of organizations using international consultants. These are:

International Organizations
US Government
Industry
International Public-Service Organizations

The United Nations (UN), as an example of an international organization, uses a quota system based upon nationality in its employment practice, attempting to maintain a balance among its employees and consultants. Thus, it can be difficult to obtain consultancies unless you have specific talents which are unavailable elsewhere. Table 35-1 indicates places to inquire about international consultancies and where you can register.

Many large US manufacturing and consulting organizations do overseas business. Most business is not in instructional technology, but industry does have needs for training to support its products or services.

International public-service organizations, such as the Red Cross or CARE, as well as religious organizations have some training components. These organizations stress the use of personal contact and involvement as a way to find out about these opportunities.

HOW TO GET INVOLVED

International Organizations

Breaking into a consultancy arrangement with a UN organization is often difficult because of the quota system. The best way is to accept short-term assignments with an organization so that your talents become apparent and working relationships can be established. Once you are known it may be feasible to investigate the possibilities of a personal-service contract.

UN organizations often contact US educational institutions or US governmental organizations for recommendations for consultants. It is useful to mention your capabilities, interests, and availability for overseas assignments to these organizations.

If in some other capacity you have done work for a foreign government, that government can recommend you to the appropriate UN organization.

US Government

The Commerce Business Daily (CBD) lists opportunities for consultancies or projects with US Governmental agencies and foreign governments. The CBD also announces recipients of contracts, allowing you to contact organizations which are known to have a project in hand that may have a place for your talents.

The Agency for International Development (AID) publishes a listing of uncoming projects as well as of contracts awarded. Often contractors of AID projects are looking for consultant assistance and need people to perform specific tasks on short notice for a set period of time. Registering your name and talents with these organizations places you in a pool that is regularly accessed for overseas appointments. Minority contractors are another group receiving preference from the US Government. Contacting them can be useful, since they often need short-term assistance.

Table 35-2 shows United States Government organizations that possibly have needs for instructional technologists.

Industry

Occasionally, industries advertise in professional trade-journals for individual overseas openings. In general, private industry prefers to send in-house people, individuals with whom they are acquainted, or individuals who are familiar with the goals of the industry.

Public Service

There are two major types of public-service organizations: religious and volunteer. In both cases it is important to be known by the organizations involved, since they prefer persons with both technical competence and with convictions which are similar to those of the organization. Service to the organization is stressed and thus remuneration is usually not as high as that in other areas of consultant employment.

How to Prepare[2]

You cannot expect to be fully prepared for an overseas job--certainly not as a result of the usual educational experiences. International consulting is not taught in school, nor is the information on its conduct available in the library. However, this does not mean that you must learn everything through experience.

Pre-trip research can be especially helpful to your preparation. For example, it is highly unlikely that one of us will be the first consultant every to bring computer-assisted instruction to Yugoslavia; others have probably already been there. Therefore, you can ask the client what has been done so

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[1] The following sections have been taken from Titus and Austin, 1980. See the complete paper for more details.

[2] See Foster (1965), and Stewart (1972).

Table 35-1. Possible International Organizations Having Needs For Instructional Technologists.

Organization	Contact Personnel Officer at
AFDB	African Development Bank, Boite Postal 1387 Abidjan, Ivory Coast
AF	Arab Fund for Economic and Social Development, P.O. Box 21923 Kuwait
ASDB	Asian Development Bank, P.O. Box 408 Manila, Phillipines
CDB	Caribbean Development Bank, P.O. Box 408 Wildey, St. Michael, Barbados, W.I.
EXIM	Export Import Bank of the United States, 811 Vermont Ave., Washington, DC 20571
FAO	Food and Agriculture Organization, Via Delle Terme di Caracal Caracalla 00100 Rome, Italy
IAEA	International Atomic Energy Agency, Kaertnerring 11, A 1010 Vienna 1, Austria
IBRD	International Bank for Reconstruction and Development, 1818 H. Street, N.W., Washington, DC 20433
ICAO	International Civil Aviation Organization, International Aviation Building, 1080 University Street Montreal 101, Canada
IDA	International Development Association, 1818 - 17th Street, NW, Washington, DC 20433
IDB	Inter-American Development Bank, 808 17th Street, NW, Washington, DC
IDRC	International Development Research Centre, P.O. Box 8500, Ottawa, Canada K1g 3H9
IFC	International Finance Corporation, 1818 H. Street, NW, Washington, DC 20433
ILO	International Labor Organization, CH 1211 Geneva 22 Switzerland
IMCO	Inter-governmental Maritime Consultant Organization, 101-104 Picadilly, London [illegible]V OAE, United Kingdom
IMF	International Monetary Fund, 19th and H. Streets, NW, Washington, DC 20006
IPC	International Potato Center, Lima, Peru
ITU	International Telecommunications Union, Place Des Nations, 1211 Geneva 20, Switzerland
OAS	Organization of American States, Washington, DC 20006
UN	United Nations, New York, NY 10017
UNCTAD	United Nations Conference on Trade and Development, Plais Des Nations, 1211 Geneve 17, Switzerland
UNDP	United Nations Development Programme, New York, NY 10017
UNESCO	United Nations Educational, Scientific and Cultural Organization, Place De Fontenoy, Paris, France
UNFE	United Nations Program, New York, NY 10017
UNICEF	United Nations International Children Fund, New York, NY 10017
UNIDO	United Nations Industrial Development Organizations, Lerchenfelderstrass 1, P.O. Box 707, A-1070, Vienna, Austria
UNITAR	United Nations Institute for Training and Research, New York, NY 10017
UPU	Universal Postal Union, Welpoststrasse 4, 300 Bern, Switzerland
WHO	World Health Organization, Avenue Appia, 1211 Geneva 24, Switzerland
WMO	World Meteorological Organization, 41 Avenue Guiseppe Motta, 211 Geneva 20, Switzerland

Table 35-2. United States Government Organizations Possibly Having Needs For Instructional Technologists.

Organization	Contact Personnel Officer at
AID	USAID/State Department, Washington, DC 20523
Peace Corps	Peace Corps/State Department, Washington, DC 20523
USIA	United States Information Agency, Washington, DC 20523

far; you can also contact other consultants who have worked on similar projects or who have worked in Yugoslavia.

If you work for a large organization or for a multi-national company there may be in-house resources to help you prepare. If not, then the freelance or small-company consultant can begin doing research by contacting the Department of Commerce, reading World Bank (country sector-studies), obtaining AID materials, searching through various networks to see who has been in that country before or who has performed a similar service elsewhere. It is best to be as well prepared as you can before leaving on an assignment.

SPECIAL PROBLEMS OF INTERNATIONAL CONSULTING

Although a consultant may be an expert in a particular field, that expertise will not, for a number of reasons, guarantee her/his effectiveness in a strange setting. Perhaps the most important reason is the problem of communication, which is discussed in a later section. Other special problems include those discussed below.

Staffing

The sex of a consultant is important to many cultures; thus, opportunities are not equally available to female and male candidates.

Although both experience and education are considered by foreign employers, heavy emphasis is placed upon educational credentials. In many situations, the higher the degree the more desirable the candidate.

Permits

Most developing countries require a variety of permits for persons working on-site. If you are under the auspices of a UN organization, the formalities are handled by the organization. If you are employed by the US government, formalities are usually taken care of by your agency.

If you are a private consultant or are employed by a privated organization, you may need a number of permits, such as a visa, work permit, and tax-exit permit. Each country has different requirements, and you should obtain all the information you can before going into a country. In many cases you will not be able to enter a country without the proper combination of permits, which may take some time to obtain. In some cases, you will need additional documents to exit the country. Both entry and exit documents should be in order.

Project Management

All too often a consultant arrives to carry out an assignment and finds that either his counterpart is not readily available, or that a lack of information hampers his interaction with various departments of the organization involved. In addition, the organization to which you have been sent may be difficult to approach. In such cases, it is important that you deal patiently with the situation. Cultivate both a good sense of humor and the ability to solve many problems on your own.

Travel

Travel in foreign countries is often very different than in the U.S. Confirmed tickets may mean little to a local airline, and local customs dictate who is allowed on the plane. You may need to determine the character of the system in order to get the flight you need.

Personal Considerations

All recommended innoculations should be obtained before leaving the U.S. However, you must stay alert to local outbreaks of diseases and take necessary precautions. Also, make sure that personal needs such as banking, insurance, food, health needs, spare-time activities, and methods for payment of expenses are taken care of. If you do not plan ahead for these things, arranging them after arriving will be necessary and thus may involve considerable inconvenience and expense.

COMMUNICATING IN AN INTERCULTURAL SETTING

Some difficulties in communication due to cultural differences are likely to be encountered. It is important to gain a perspective concerning ways in which cultural differences can effect the conduct and outcomes in training and education, then supplement the insight by examining training programs that involve cultural differences.

A consultant working abroad in a new environment involving different rules and ways of thinking will find that some of the differences will pose no problems, but that others will. Generally, the areas of communication in which misunderstanding are likely to occur tend to fall into six categories:

Stereotypes
Language
Education and knowledge
Values and beliefs
Social systems and role expectations
Training

Let us look at some examples from these six areas.

Stereotypes

Problems can arise due to the stereotypical notions of Americans held by people in the host nation. Stereotyping, however, is a two-way street; misinterpretations can be made by both you and your host. For example, a consultant who went to a country to assist in the development of a national plan was told by a representative of the government not to use "high-brow" language, because this would intimidate the indigenous people. From experience with previous consultants who has used jargon and developed rigorous plans for the country without really listening to what the Minestry of Education wanted, this consultant found that Americans were thought to be aggressive know-it-alls.

Media, such as films and books, also influence the development of stereotypes. For example, movies can create powerful images which we may expect to encounter in reality, such as the Latin lover, the taciturn New Englander and the Western cowboy.

The ways in which authority is perceived may vary from culture to culture.

Language

An example of language differences involves the different meanings of silence. Silence may connote disapproval or some kind of underlying tension to us; in other cultures it can mean approval and agreement. Furthermore, beyond the obvious fact that people in different countries speak different languages, it is important to understand that even between cultures which speak the same language one word can have different implications.

Education and Knowledge

The amount and kind of education and information about the world possessed by an individual greatly influences her/his actions, problem-solving behavior and attitudes. A consultant might encounter such intercultural differences when working with a community-health worker in designing curricula for educating the members of the community to health care. For example, as one component of the curricula, it may be difficult to convey a concept such as the providing of medicine every three hours. Time, in terms of hours, may be a meaningless concept to people who measure time in terms of events.

Values and Beliefs

A clear example is the value of time. We value punctuality; many traditional cultures have other beliefs about the importance of time, some even consider punctuality to be in bad taste, an insult, or improper.

Social System and Role Expectation

In our culture we expect children at a certain age to go away to college or to get a job and move out of the house. This kind of independence is encouraged. However, this does not occur in all cultures. In many traditional cultures, childen are expected to stay home until they are married. If they work, this money may in part be a contribution to the family's welfare.

The ways in which authority is perceived can vary from culture to culture. For example, we accept the concepts of participatory management, and of the teacher as facilitator. In some cultures, these beliefs of ours are opposed to the images people have of teachers and managers as authority figures.

Training

Our culture supports both inductive and deductive instruction. Materials are often structured so that students test themselves and take some responsibility for learning and searching for underlying concepts. Many traditional cultures stress only the deductive method. If people have learned by this method from an early age, they may be confused when an inductive approach is suddenly introduced in a training situation. There are training programs in the U.S. which train consultants in these communication issues. They are designed to facilitate intercultural communication, and in so doing, help the person going abroad to be more effective.

Types of Programs

There are two types of programs: survival programs and competency programs:

Survival programs focus upon the culture, identifying aspects which make a culture and its people distinctive. They describe such things as necessary phrases in the local language; body language manifestations; appropriate dress and appearance, such as the leisure and business garb of a culture; food and eating habits. The beliefs and attitudes of a culture are emphasized. The participant will also learn that cultures have different ways of reasoning; are conscious of different rewards and recognitions and relationships-values; and have different senses of space and time.

Competency programs are geared more toward giving participants a way to "see" aspects of the culture and to recognize them in terms of themselves. Cultural self-awareness and intercultural communication are stressed, indicating that we must be able to analyze our own behavioral patterns first. Knowing the indiosyncracies and characteristics of a foreign culture does not necessarily aid us in working with them. We need to know where we are coming from; then we have a basis from which to see differences in human interactions involving other cultures.

Thus, for an international consultant to be able to contribute to the achievement of some goal within a culture different from his own, a knowledge of cultural differences and of intercultural communication is necessary.

A CASE STUDY
(APPLYING THE CONCEPTS DESCRIBED ABOVE)

Background

A developing country had contracted with a large consulting firm to design, supervise construction, and start up a large industrial installation. Portions of it were situated in six different locations in the country, but would be interconnected with pipelines and a radio communications network. A trainer with expertise in the technical area was called in to assist the consulting firm in developing and implementing a training plan for the country. He soon found that experience in instructional system development was of more immediate need than his technical training expertise.

Selection of Trainees

The government insisted that all trainees come from the employees already within the industry insofar as this was possible. Seniority was to dictate the order of selection. Any employee who was otherwise eligible, but was within two years of retirement, was not to be selected. Several hundred employees were to be trained to operate and maintain new facilities. The trainees were to be separated into three levels of operators and three levels of superintendents.

Twenty candidates were selected for the first effort. After several weeks of instruction, 80 percent of them had dropped out, mostly for personal reasons relating to housing (loss of government-supplied housing in new program), finance (a cut in pay in the new job), location (relocation of their families), return to shift work, health, increase of responsibilities of the new job, rigors of the training program, and standards of performance required in the new program. As a result of this, the trainer, in cooperation with the government training staff, developed a screening program for use in interviewing potential candidates. This program was carefully explained to the union and to management, and was accepted. The innovation here was that employees had some say in their personal and professional future through the discussions and feedback they received during the screening.

Successful candidates were then exposed to additional situations in which they were tested more rigorously. (Samples of subsequent self-study materials we given to them and their performance (reading and comprehension abilities) was evaluated. Sessions were held daily on various aspects of the program, and each candidate was evaluated on attendance, punctuality, classroom performance, field trip performance, oral presentation, written exams, and oral exams.) At the end of this exposure each candidate was given an in-depth critique of past performance, and was oriented to the forthcoming workshops and activities. If the candidate measured up to basic competency criteria, he was sent on to be evaluated on advance competency criteria.

The initial step was to involve the trainee with the plants to which he would eventually be assigned. This included reviewing design and construction drawings, visiting the site, reviewing manufacturer's literature, having discussions with the contractor and manufacturer's personnel and reviewing operations and maintenance manuals. Then the trainees completed a workshop on performance problem solving. This was followed by technical workshops on various aspects of plant operations. Successful completion of these events brought about an assignment to a plant to gain experience.

It was found that employees in this system had previously received very little formal feedback on their performance. For the most part, advancement up the career ladder has been based on serving time. Good or bad performance had little to do with advancement. The constant feedback used in the reorganized training program was well liked by the trainees since it helped them improve their performance.

Objectives of the Training Program

The following broad objectives were developed for the training program:

- Development and imlementation of a training program for personnel to be assigned to the six new plants
- Upgrading of present personnel to fill these positions
- Development of the capability in these trainees of analyzing performance problems and developing solutions for these problems
- Development of the skills in these trainees to develop job aids for operational and maintenance procedures
- Preparation of each trainee to serve as a trainer in the position he is assigned
- Development of the skills in these

trainees to evaluate training materials, operations and maintenance manuals, job aids, their fellow employees and themselves, and

- Development of the knowledge and skill to operate, maintain and manage the plant to which they were assigned.

Objectives of the On-the-Job Training

The purpose of the on-the-job training during plant start-up was to:

- Allow the trainees to become familiar with the operations and maintenance features of the plants. The trainees actually operated the plant, with guidance as needed.
- Validate the operations and maintenance manuals produced by the consultant and become familiar with the manufacturers and suppliers' manuals.
- Perfect skills in performing and analyzing quality control tests and make process control decisions based on the test results.
- Permit superintendent candidates to obtain experience both as an operator and as a superintendent.
- Gain supervisory experience of all plant personnel, evaluate performance of these personnel, make decisions about plant operations and process control, develop an inventory system for supplies and materials and prepare budgets.
- Permit operators to obtain experience at their substantive position and the next higher position, should they be assigned to such a post.

Many of the trainees were able to have assignments at several plants. Thus, their field experience better equipped them for whichever plant their eventual assignment would dictate.

Trainee Involvement in Their Own Training

One of the major purposes of the training program was to prepare the trainees for their new positions in the plants. Since they were to be the superintendents and senior operators, their duties included training of other staff members as they were assigned to the plants. Thus, opportunities were provided throughout the training program to obtain experience as a trainer.

Throughout the program each trainee was given many opportunities to communicate orally. Many of them had never done this in front of a group, and it proved to be a traumatic experience for them. Early in the program they were asked to make a presentation concerning their own background. This was followed by their analysis of problems encountered in their own work situations. During the sessions of orienting them to the new plants they were broken into small groups and were required to analyze certain aspects of the plant design, and to explain these features to their fellow trainers.

During the training program for these personnel selected as potential supervisors for the new plants, it was found that many candidates were not aware of the services, responsibilities and duties or personnel in other divisions. To overcome this, and to better prepare these persons who were to receive responsible positions in the new plants, a guide was prepared to assist new supervisory personnel in becoming familiar with the internal workings of the organization. This guide pointed out:

The persons and groups that should be included in the orientation program.

The topics that should be discussed in this orientation.

A schedule for carrying out this orientation.

The role of the supervisor of the employee receiving the orientation.

Early in the planning for the training program it was decided to strengthen the trainees capability in analyzing performance-problems, and, in developing training, to correct knowledge and skill deficiencies. Two workshops were given to the trainees. The objectives of the performance problem-solving workshops were to assist trainees in:

Gathering data to specify performance-deficiencies in their workers.

Setting priorities for solving these problems in order to benefit the organization.

Determining the cause(s) of the performance problem(s).

Deciding upon the best solution(s) to the problem(s); and

Selecting the most cost-effective solution.

In order for the trainees to put this material into use in their assignments, a group of them prepared documents to assist with the effort. The documents "Performance-Problem Analysis Field-Book" and "Job-Aid for the Use of Performance-Problem Analysis Field-Book" were used by a number of trainees in the field and revised as necessary. They are now being used to supply information or training needs to the training center.

A second workshop entitled "Job-Aids Workshop" was given to many of the trainees. It was decided that each task in the operation and maintenance area would be described in a job-aid. These would be available on the job and for training of personnel. The objective of the "Job-Aid Workshop" was to assist trainees in:

Describing master-performance in sufficient detail for use in job-aid development.

Deciding when to use total recall, a pure job-aid, or a mixture of job-aid and recall in actual job-performance situations.

Deciding upon the format of job-aids for guiding various types of job performance.

Preparing job-aids, including:

    Checklists
    Cookbooks
    Algorithms

Work Sheets
Decision Tables
Combination of the above

Testing a job-aid.

Since our major aim of the training program was to prepare each trainee for his role of trainer in his new assignment, trainees were selected to be a part of the instructional staff of the performance-problem-solving and job-aids workshop. Each workshop has a workshop director who was responsible for overall planning, making assignments, and directing the workshop. The director was assisted by lead instructors who were each in charge of presenting a module of instruction. Their duties included introducing the concepts in the module, leading a discussion of its contents and practice exercises, and directing the completion of worksheets.

The lead instructor was, in turn, assisted by other lead instructors and by a group of assistant-instructors. This group was available for providing one-to-one assistance to the trainees in the workshop. They gave assistance with clarifying material in the self-study modules, practice exercises, and worksheets. In the early workshops, the author and his staff played all of the above roles. Later, two of the trainees were selected to serve as assistant-instructors. After this, trainees were selected to serve in all three roles. Assistance was given in the planning and conduct of the workshop when needed. During the workshop breaks (three or four times per day) the entire staff was gathered together and the performance of the staff discussed. Each problem was analyzed and discussed regarding what to do in the future to prevent its recurrence. Even though the trainer was in the workshop most of the time, she/he did not intervene or prompt the instructor. The situation was allowed to develop and the instructor involved solved problems as best he could. The discussions at the breaks were devoted to a review of the situation and a decision about what to do in the future. The trainer kept critique sheets on each instructor's performance. These were reviewed with the instructor and his peers. This approach turned out to be a great learning experience for the trainees. Not only did it increase their own knowledge of the subject-matter and their ability to implement it, but it gave them greater confidence in handling training situations. Just as important, the training program became their program, not just one presented to them by outsiders.

Eventually the two workshops were run entirely by qualified trainees. Assistance was given during the planning only when requested. The success of this effort is being demonstrated by the performance of these trainees in their fieldwork.

Two aspects of the work performed by the trainees assigned to the plants were to develop job-aids to assist in plant operations and to maintain and train new operators as they were assigned to the plant. Each trainee reviewed the Operation and Maintenance Manual for their plant along with manufacturer's bulletin and design specifications and drawings. Using these documents, along with the operational experience gained at the plant, the operators generated the basic material for a job-aid. This team had members who had also taken the job-aids course and who were familiar with the production process. They worked with the operator at the plant in recording required information. They would then transfer this information into a format suitable for use on the job. After it was checked by the operator as to correct technical content, it was fieldtested by other operators in the same or different plants. Revisions were made as necessary until it met the development standards. The job-aid was not approved for use until it has been used by new trainees and they had performed satisfactorily with the assistance of the job-aid.

Services provided by the team included drafting job-aids, providing graphics, checking the clarity and appropriateness of language and validating technical content. The ultimate test provided by the team was to validate the usefulness of the job-aid to a new trainee in performing her/his tasks on the job. Often a job-aid produced at one plant could be used with slight modifications at another. Assistance was given with this. This assistance greatly reduced the amount of time taken to produce job-aids for all the plants.

Evaluation

Some of the unique features of this training program were the various types of evaluation used, how these were developed, and the feedback mechanism they used. A number of forms were developed for use in various aspects of the program. The use of these forms during the workshops and early training differed from the customary system used in the organization. The normal evaluation conducted by supervisors and kept on file in the Personnel Division, was not available to the employee. Normally, an employee only received an indication of her/his evaluation when there was something detrimental about it. If she/he was doing an adequate or even an exemplary job, there was no feedback provided.

In the performance-appraisal system developed for this program, several departures were made from the usual practice. Based upon the various forms used in the screening process and during the workshop-training period, the trainees became acclimated to the continuous evaluation procedures. In fact, the first class helped establish what would be evaluated and what standards would be used.

Information from these evaluations had been used to improve individual as well as group performance. Feedback was given constantly on performance, and the trainees realized that this was meant to be constructive. Moreover, they soon learned to accept it in this light. Thus, they asked that this be continued in their field placements.

Each trainee-superintendent was asked to complete these forms on a monthly basis. Assistance was available from the training staff in interpreting the factors being evaluated. It should be remembered that this appraisal activity was a new experience for the trainee-superintendent who was given the opportunity to discuss the appraisal with the trainee, either alone or in the presence of a member of the training staff. In most cases, the trainee-superintendents had sufficient self-confidence to carry out the interview on their own. Occasionally assistance was requested. All trainees were aware that this appraisal system was an outgrowth of the performance problem-solving workshops which they had just completed and was one way in which to apply the methodologies they had learned. In addition, they had played a part in the development of the forms and evaluation system and were interested in its utility. Most important, they were interested in their own performance and were constantly seeking constructive feedback concerning their strengths and weaknesses and ways in which they could improve.

Some Conclusions

The success of the training program for operational personnel is attributed to two major reasons: namely, the continuous and extensive involvement of the trainees in their own training program, and the in-depth evaluations with feedback that were used throughout the program. Not only was there a noticeable improvement in the knowledge and skill of the trainees in their day-to-day tasks, but also in their ability to analyze and solve problems. Just as important, they developed a positive attitude toward the training program and many felt that the program was theirs. This attitude was noted not only the trainees closely associated with the program but also by the consultants, management, and union representatives.

The benefit of the application of instructional development techniques was also demonstrated by the capability of the operators and superintendents in running their plants. The self-confidence developed by the operators and superintendents during their training carried over into their performance at their plants. This was shown in comments from their supervisors.

REWARDS AS AN INSTRUCTIONAL DEVELOPER IN AN INTERNATIONAL SETTING

International consulting is rewarding from the standpoint of allowing the instructional developer to travel and learn more about other cultures and the relationships of these cultures with their own. Professionally, instructional developers are afforded an opportunity to try their expertise in a variety of situations and to develop a broader perspective, which provides insights to be utilized not only in continued overseas consulting but also in domestic consulting. Often overseas consulting brings instructional developers into contact with trainees who have never had a chance to really learn. They have always been told what to do and how to do it, with little feedback provided to them during the learning process. The techniques used in performance technology often assist the trainee in developing self-esteem and decision-making ability; thus, they feel that the job is now theirs, that they should do it well, and that they are not working for someone else. Watching this process unfold can be one of the more rewarding features of overseas consulting.

SUMMARY

The consultant has available a variety of avenues for approaching the international marketplace. Four main areas are identified: international organizations, the U.S. government, industry, and international public-service organizations. Different kinds of work geared to meet the needs of each particular organization are available. The services provided are basically: (1) the transfer of technology through training, and (2) the design of instructional programs to provide assistance in areas of need (i.e., where the expertise is not readily available in the requesting country). To become successful participants in this arena, the consultants must prepare themselves for overseas work involving travel in and adaption to a different environment and culture. Recognizing and dealing with these special considerations is vital to such a mission.

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Chapter 36

Innovation on Command: Instructional Development and Educational Technology in the Soviet Union

Stephen T. Kerr

In order to know how to perform our jobs in the best way possible, we must know the very latest findings from research and from developmental studies. This means, of course, not only those findings from American scholars and practitioners, but from scholars and practitioners wherever they may happen to work. The present article discusses such findings from the USSR, together with the environment within which these findings have validity and from which they have originated.

INTRODUCTION: THE WESTERN VISITOR MISLED

The Western visitor to a Soviet educational institution might easily be led astray in trying to start a conversation about instructional development. First, the translation of the term itself would likely cause difficulty. The Russian language now includes a number of terms that correspond reasonably well to "educational technology" or "audio-visual media," but it lacks a single, widely-accepted term for what we call "instructional development." A second problem would be the lack of a well-defined occupational group concerned with instructional development issues, organized into professional associations and publishing journals dealing exclusively with their field. Individuals involved with instructional development questions exist, to be sure, but it is far more difficult to identify them and tag them with a convenient title than it is in the West. Finally, at a deeper level there are a number of distinctive features of the Soviet educational system--a popular fascination with technology and its effects; a strange mixture of centralized, bureaucratic government planning with an almost feudal administration pattern in higher education; and a dramatically high degree of public prestige attached to teaching positions in soviet universities and institutes--that give a very unfamiliar cast to the role played by instructional development in the USSR.

Facing this combination of translation problems and cultural differences, the hypothetical Western visitor might understandably leap to the conclusion that the institution is promoting some monstrous KGB cover-up of instructional development in the service of Soviet military conquest, or perhaps s/he will merely write off the experience with a shrug and a conclusion that Soviet educators are not really involved in instructional development.

But while the communication problems are real, they can be overcome through perseverance. For there does exist in the USSR a well-developed network of organizations, social structures, and administrative arrangements for dealing with the same problems that are commonly handled by ID programs and practitioners in the West. A rapidly-expanding educational materials and equipment industry, for example, serves Soviet educators at all levels and a broad system of "qualification raising" in teaching encourages them to use resources more effectively in their classes.

These two interconnected systems--for technology and for the improvement of instruction--form the basis for ID in the USSR. Both these systems have grown rapidly over the past decade, both are apparently priority targets for further swift development by the Soviet leadership, and both are therefore currently topics of some discussion in the Soviet educational press and journals. These attempts to expand the application of educational technology in the Soviet Union, however, have not met with unqualified success; there have also been some notable problems with implementation. The result is a program that mirrors the country as a whole in its broad conceptualization, its centralization, its occasional stunning successes, and its generally low level of efficiency.

Plan of the Chapter

The intent here is first to note briefly a number of characteristics of the Soviet educational system which are unique or which may be of help to us in understanding the position of instructional development in the USSR. The next major portion of the chapter describes how educational technology has developed in the USSR and what some of the major successes and failures of these agencies have been. Next, the specific role of ID and "qualification raising" programs in Soviet higher education is discussed; the purpose of this section, again, is to describe the current system, and to outline its achievements and problems. This section also includes a brief examination of what Soviet and American educational technologists do and do not know about one another's work. Finally, a concluding section summarizes the information at hand about Soviet ID efforts and evaluates it in the particular context of Soviet society. The focus of interest here is on the extent to which "innovation on command" works now and may work in the future.

CONTEXT: ESSENTIAL FEATURES OF SOVIET EDUCATION

Structure

The USSR provides free education for all citizens through grades K-10 of the school system. Following grade 8, students may choose to complete their secondary education at a general secondary school (which prepares students for either further education or a job), a vocational school (offering training, usually in a manual job skill, combined with the final two years of school), or a specialized secondary school (which also offers job training, but of a higher order, and the complete high school course). The guarantee of a full ten-year education for all is a recent development in the Soviet Union, having been written into law only in 1973.

After secondary school, about 20% of Soviet young people continue with their education as students in universities or institutes. While the number of openings in higher education has increased over the past 15 years, the increase in this area has not kept pace with population growth. Even fewer of the Soviet university graduates can continue to graduate school where, after two to four years of further study, they receive a "candidate" degree, roughly equivalent to an American doctorate. The degree of "doctor" is granted only after years of productive scholarly work, and remains a rarity among the Soviet professorate. Entrance to all educational institutions above the secondary level is thus highly competitive, and completion of higher education provides Soviet young people what is often described as a "passport to the good life."

Above the elementary level in the USSR, teaching is often still synonymous with lecturing. Classical European (especially French and German) models of what good teaching consists of predominated in the Soviet Union even following the Russian Revolution of 1917, and teachers and students still spend a much higher percentage of their time in class than would be the case in the United States. A Soviet university student may put in as many as 36 hours of classroom time per week. Courses are relatively narrow and specialized; a first-year student in journalism, for example, would likely be taking only journalism courses, plus perhaps a required course on Marxism-Leninism or Party History. The notion of a liberal-arts education, and consequently of large, introductory courses for students from diverse disciplinary backgrounds, is unknown.

Centralization

The USSR Ministry of Education in Moscow plans the curriculum of all schools through the general-secondary level. As a result, central administrators can rightly claim that they know what is being taught at any time in any part of the country. The situation in specialized secondary schools and higher educational institutions is not quite so uniform. Indeed, many such institutions report not to the Ministry of Higher and Specialized Secondary Education, but to other ministries which run schools and institutes for the preparation of personnel. The Ministry of Ferrous Metallurgy, for example, coordinates its own secondary schools and higher educational institutes for the preparation of steel mill technicians and engineers.

While most decisions regarding curriculum and even teaching methods are made in Moscow, the Ministries of Education (and of Higher and Specialized Secondary Education) in each of the 15 union republics of the USSR (the Ukraine, Georgia, Lithuania, etc.) have some influence over local education. National languages, for example, are still taught in republic schools, and some decisions regarding that teaching are made on the republic level. Finally, there are local educational agencies on the levels equivalent to counties and cities that have a minor say in curriculum decisions which deal with local issues.

Research and Development

While Soviet education is centralized, one should not get the impression that there is monolithic agreement among Soviet educators about the definition of educational programs or about how to carry them out. In fact, there are a number of diverse groups within the Soviet educational establishment. The **ministries** have already been noted. A number of government **committees** have key roles in making policy and planning for future developments. The **Academy of Pedagogical Sciences** and its associated research institutes are responsible for the overall coordination of educational research and development. And the **Communist Party of the Soviet Union** (CPSU), through both national and local organizations, plays the "leading role" in deciding the general direction for the country's educational system.

Research and development in Soviet education differs from that found in the West in several important respects. First, there is very little work done on education in the USSR that does not have some immediately practical cast. Often the impetus for a research project comes from a noneducational ministry or even from a factory. For example, much research has been done recently on vocational education and on how to help young people choose "socially valuable" professions--research occasioned by a labor shortage in the USSR.

Soviet educational research is also much less quantitative and much more descriptive than Westerners are accustomed to reading. Rarely do Soviet educational journals carry an article with even a single table of data, and statistical-significance tests of any sort are simply not part of the landscape. (Some change in this regard is now visible in Soviet sociology, economics, and management studies, but the literature in education is still strikingly discursive.)

A Note on Terminology

Some clarification of the Russian terms used in discussing educational technology and ID may be in order at this point. The term "technical means of instruction" ("tekhnicheskie sredstva obucheniia," or TSO) is commonly used in Soviet parlance in the same way "educational technology" is used in the United States--to stand for hardware, software, and (increasingly) the process of planning for their appropriate use. References to "audiovisual" ("audiovizualnyi") materials occur frequently, and there is a newer term, "screen-sound" ("ekranno-zvukovoi"), which is roughly equivalent. Names for types of hardware are generally parallel in both languages.

Turning to ID, the terminological waters become muddier. The closest one gets to the Western idea of ID is perhaps in the term "pedagogical qualification raising" (Povyshenie pedagogicheskoi Kvalifikatsii"; Veselov and Tinovskii, 1978), but that expression is a rarity. Far more commonly encountered is the simpler "qualification raising" ("povyshenie kvalifikatsii"), which stands for a type of in-service training which includes improvement of both subject-matter expertise and teaching skills. A related notion, "pedagogical mastery" ("pedagogicheskoe masterstvo"), is less popular and appears to have a less-prestigious cachet than "qualification raising." Those persons working with instructors on the design of material or lesson content would likely be called "methodologists" ("metodisty").

THE DEVELOPMENT OF EDUCATIONAL TECHNOLOGY IN THE USSR

It is startling to realize that, until very recently, the school system of the USSR resembled more closely what one would expect to find in a developing nation than what one would attribute to a world superpower. The Soviets have always done a good job of presenting their best face to visitors from abroad, and the casual visitor may be impressed at the high level of technology displayed in the schools. Guests, however, rarely see education at work in the average city school, in the run-of-the-mill, industry-oriented higher educational institute, or in rural schools. Fragmentary anecdotal reports paint a grim picture of insufficient materials and poorly-trained teachers.

Under such conditions of general educational underdevelopment and hardship, then, it is not surprising that the provision of educational technology on a broad scale was only a dream for Soviet planners until recently. Writing in 1973, I. Driga (head of the Ministry of Education's Directorate of Supply to Schools of Visual Aids and Educational Equipment) noted that of 380 schools in the Turkmen Republic in South Central Asia, only 29 (7.6%) had a 16mm projector available. He also indicated that, as of 1968, each film copy had to serve 150 schools, and that by 1971 each film had to serve only 15 schools.

The late 1960s and early 1970s brought a major, officially-backed push to increase the **quantities** of educational equipment and materials available to educational institutions at all levels and to help assure that the **quality** of use improved as well. A lead editorial in **Pravda**, for example, urged teachers to make more careful use of the 150 million rubles (about $225 million) worth of educational equipment provided to educational institutions that year (Zdravstvui, 1975). Official decrees from the Central Committee of the CPSU and the Council of Ministers--the weightiest form of "advice" in a Communist country--demanded in 1972 that higher educational institutions make wider use of educational technology in teaching, and that organizations responsible for providing materials do a better job (0 merakh, 1973).

This drive to provide the basic hardware and software of educational technology to Soviet educators is thus a very recent phenomenon, and it continues today with the introduction of an increasing variety of equipment. It therefore

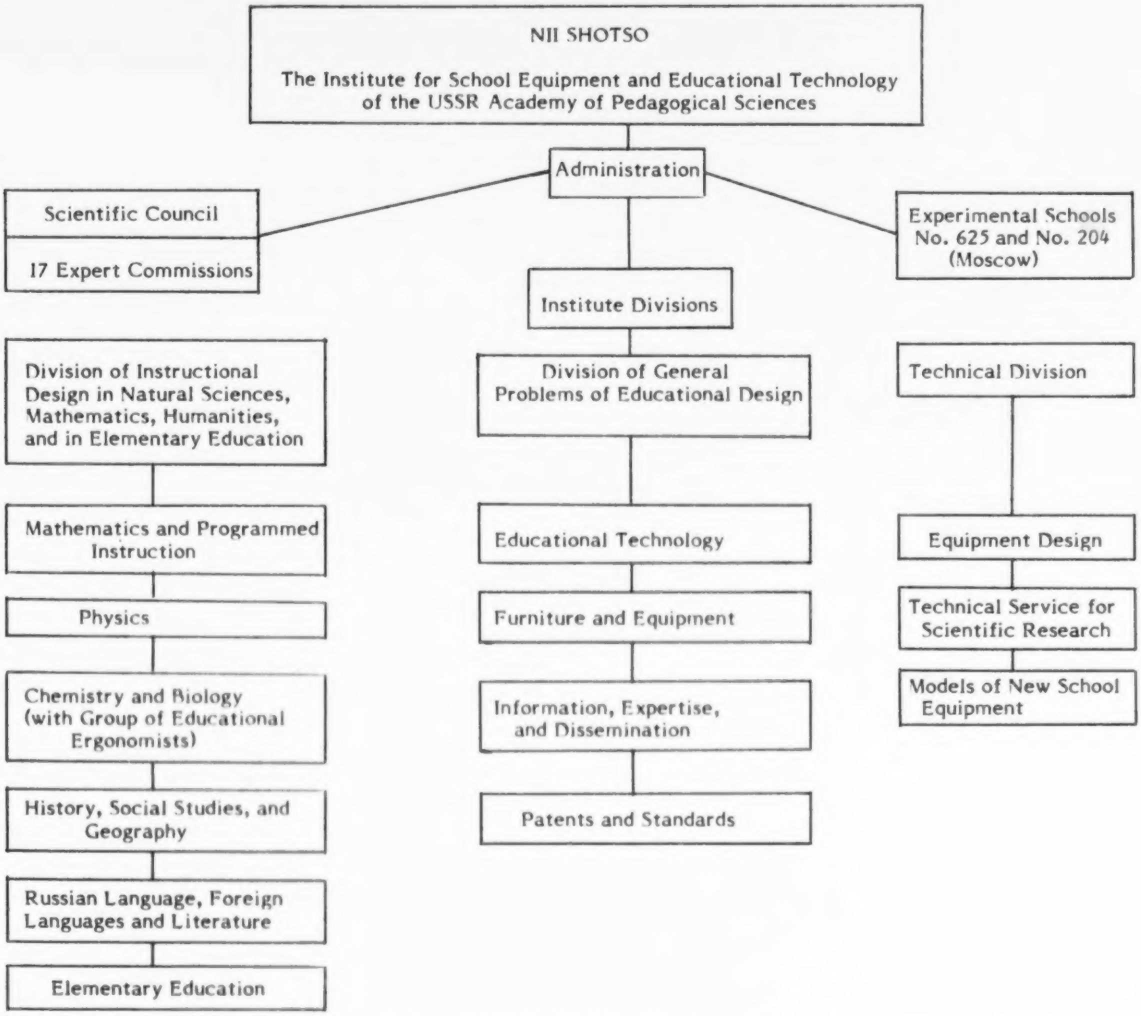
NII SHOTSO
The Institute for School Equipment and Educational Technology of the USSR Academy of Pedagogical Sciences
Administration
Scientific Council
17 Expert Commissions
Experimental Schools No. 625 and No. 204 (Moscow)
Institute Divisions
Division of Instructional Design in Natural Sciences, Mathematics, Humanities, and in Elementary Education
Mathematics and Programmed Instruction
Physics
Chemistry and Biology (with Group of Educational Ergonomists)
History, Social Studies, and Geography
Russian Language, Foreign Languages and Literature
Elementary Education
Division of General Problems of Educational Design
Educational Technology
Furniture and Equipment
Information, Expertise, and Dissemination
Patents and Standards
Technical Division
Equipment Design
Technical Service for Scientific Research
Models of New School Equipment

Figure 36-1. Organizational structure of the Institute for School Equipment and Educational Technology of the USSR Academy of Pedagogical Sciences.

makes sense to examine here in some detail one of the agencies responsible for this significant change in educational practice.

NII SHOTSHO: THE INSTITUTE FOR SCHOOL EQUIPMENT AND EDUCATIONAL TECHNOLOGY

The Scientific Research Institute for School Equipment and Educational Technology ("NII SHOTSO") is one of the research and development institutes associated with the Academy of Pedagogical Sciences of the USSR. The institute was created for the express purpose of developing both materials and equipment (including furniture) for schools in the K-10 educational system. Figure 36-1 shows the formal structure of the institute.

The figure identifies the three main functions that SHOTSO fulfills in the Soviet educational system: instructional design of materials to be used in elementary and general secondary schools in all subject areas; technical design of audio-visual equipment of all sorts; and dissemination and planning activities connected with both instructional and technical design. Each of these areas will be dealt with in further detail below.[1]

Instructional Design. The instructional design functions of SHOTSO are truly staggering: here is an institute with a relatively small staff working on ID problems, responsible for developing supplementary and some textual materials for teachers in 150,000 schools around the largest country in the world. As Figure 36-1 indicates, the development functions of SHOTSO are divided into five specialized secondary areas (math, physics, etc.) and one area focusing on elementary education. Proposals for new materials may be developed internally, or they may be channeled to the institute from a ministry, or submitted directly by teachers. In any event, the Scientific Commission meets once a month and considers specific proposals for both materials and equipment. Approved proposals are then sent to "Expert Commissions" having responsibility for a particular type of material. (Film, slide, and transparency proposals, for example, are sent to a "Screen Commission," which meets weekly.) SHOTSO develops scripts and story boards only; actual production is left to one of a number of film studios and production groups; their producers work with the institute in creating the final product.

The Instructional Design Division also concentrates some of its efforts upon the preparation of print materials--teachers's guides, unusual textbooks, graphics, and the like. SHOTSO staff justify this stress upon print materials by pointing to the heavy use these items get in schools and their relatively low cost in comparison to films and other media (Zel'manova and Maurina, 1978; Volovich, 1979). Development of non-print materials, however, clearly lies at the core of the institute's tasks. There is a kind of non-rational enthusiasm for media **qua** media that can readily be discerned in staff members' remarks: "These materials represent the best current scientific thinking about education;" "Media speak to young people in their native language; they meet the demands of the current generation."

The overall purpose that the SHOTSO staff see in their instructional development work is not entertainment, **per se,** but rather a degree of involvement sufficient to encourage the necessary exposure of youth to printed texts and to the classics of literature. Too, the oft-noted requirements that materials be practical, that they contribute to concrete results in the classroom, means that nothing is produced with indefinite purposes in mind. Indeed, the level of scrutiny which is focussed upon the development of materials in such fields as social studies, humanities, and history probably exceeds that in the West. Take the case of a pilot version of a film dealing with the origin of various figures of speech in the Russian language: at the start of the film, short passages from varying contexts are heard on the sound track--a newscast, lovers talking in a park. Meanwhile, the screen remains blank except for a single glowing color suffusing the viewing area. The color changes for each voice, green for the lovers, red for the "officialese" of the radio announcer, etc. SHOTSO staff indicated that this approach was seen as quite novel and controversial. They were unsure whether they could justify incorporating these effects into the final, released version of the film.

Obviously, a centrally-determined curriculum for the nation as a whole makes the Instructional Design Division's work much easier. Knowing that all sixth-grade geography classes must cover certain topics during the course of the year, the developers may create their materials secure in the knowledge that, when they are ready, they will be used by a given number of teachers working with a given number of children in a given number of schools.

Technical Design. The Technical Design Division of SHOTSO is responsible for designing audio-visual equipment, developing prototypes of new equipment, and preparing certain types of specialized scientific gear for use in educational research. It also performs an oversight function, checking the quality of films, filmstrips, and other materials produced by outside studios. Proposals for new types of equipment are received and processed in the same way as proposals for new types of instructional materials.

Films and filmstrips (including color and black-and-white, and silent and sound versions of each), together with video tape-recording systems, seem to be the major targets for SHOTSO at present. Filmstrips are obviously cheap (costs: about 31¢ for a black-and-white strip, 46¢ for color) and require relatively little in the way of equipment for use. The Technical Design Division has pioneered in the development of a low-cost, simply-designed filmstrip projector with a minimum number of parts.

The need for such sturdy systems becomes clear if one imagines the size of the country, the relatively crude conditions pertaining in many outlying areas, and the vast numbers of devices and materials which must be manufactured in order to equip all schools even minimally. The estimated production-run for a filmstrip is 90,000 copies, while films are typically produced in editions of 14,000 copies. Although these production-runs are partially explained by the size of the country and of the educational system, they are also partially an artifact of centralized planning: if every tenth-grade social studies class is to see a film about the Soviet Constitution, they will all likely see that film within a span of a few weeks. The tenfold reduction in the ratio of film copies to schools from 1:150 to 1:15, cited earlier, is an attempt to ameliorate the problems created by this situation.

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[1] Much of the information regarding the structure and operation of SHOTSO is drawn from the author's conversations with institute staff members during a visit there in January, 1978 and from correspondence over the period 1974-1980. Published commentaries by SHOTSO's director, S. G. Shapovalenko (1976; Iubileinaia, 1978) provide additional data on the institute's activities.

Soviet educators have been enthusiastic about television for many years, but have been hindered in their use of it by a lack of reliable, locally-produced video tape recorders. The wide-scale introduction of these devices was begun only in 1979, and promised to free teachers eventually from centrally-determined schedules for broadcasting to schools (Zaznobina and Pressman, 1979).

Dissemination and Planning. In a centralized system, planning obviously assumes a high level of importance. And, when innovation, by definition, comes from the top down (or must at least be channeled through the top in order eventually to make its way down), dissemination also becomes critical. The Division of General Problems of Educational Design, then, plays a key role in seeing that new materials and equipment are carefully planned for and then actually used.

Dissemination activities, in the form of special teacher training programs, are conducted both in Moscow and around the country. SHOTSO itself has several schools affiliated with it for developmental testing of materials and equipment. In one of those schools, 5000 teachers each year are given instruction about educational technology; they also get a chance to see new materials actually being used by teachers in those schools.

The staff of SHOTSO also communicate their ideas through scholarly publications. Although there is no regular Soviet periodical on educational technology, relevant articles do appear in such journals as Soviet Pedagogy (Sovetskaia pedagogika; a general periodical on problems of education), National Education (Narodnoe obrazovanie; a magazine intended for teachers and principals), Higher Education Courier (Vestnik vysshei shkoly; a general journal on higher education), and Questions of Psychology (Voprosy psikhologii; a journal focusing on issues in research psychology). There is also a variety of field-specific journals intended for secondary school teachers which comment regularly upon the use of educational technology (e.g., Chemistry in the School). Other publication avenues include conference proceedings (e.g., Piatia, 1969), and general or subject-specific books authored by SHOTSO staff members (e.g., Poltorak, 1976; Vestitskii, 1977; Pressman, 1972, 1979).[2]

Pre- and In-Service Teacher Education

In addition to SHOTSO's activities, there are various other ways in which teachers in the USSR learn about educational technology. Teachers-in-training must take a course on audio-visual techniques, involving about 32-40 hours of classroom contact, as part of their pre-service preparation. In addition, they are expected to learn how to use equipment during their training, and to demonstrate their knowledge by including the use of educational technology in one-third to one-half of the sample lessons they give before graduating. The certification exam given to new teachers must include questions on the use of media, and a teacher is expected to know key items from a catalog of materials in her or his subject-area.

Even after graduation, the stress upon educational technology continues. Teachers throughout the country are required to take in-service courses in both subject-areas and methodology at least once every five years (this is part of the "qualification raising" system to be discussed later). These courses usually take place at "Teacher Improvement Institutes," which in turn stay in touch with SHOTSO and other agencies for the latest information. Regional departments of education can give teachers one free in-service day per year to work on new teaching methods, and higher-level educational bodies can give up to a month's leave for special projects involving methods. For some, there is an immediate practical payoff; these courses can lead to the awarding of special permits which are needed in order to obtain films and even for permission to operate projectors. The bureaucratic element here should not be ignored, but neither should the practical necessity of protecting hardware and software in a country that until very recently has had little enough of either.

Local departments of education also employ staff members whose sole duty it is to act as curriculum or instructional developers. The Russian term for them, "methodologist," however, does not connote in the Soviet context so much a separate job description, or special status, which is different from that of a teacher; rather, it indicates that these are especially experienced and able teachers who are recognized as providers-of-information concerning the teaching of the particular fields in which they themselves have taught for a number of years. As methodologists, however, they would be expected to demonstrate competence with a wide variety of teaching techniques and would also be expected to know a good deal about educational technology.

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[2] The lack of a journal devoted exclusively to educational technology may seem strange to those accustomed to the plethora of specialized publications available in the USA and Europe. In the USSR, however, it is the norm to have relatively few periodicals in any given field. Sociology, for example, had to make do with publishing its articles in philosophy and psychology journals for the ten-year period following its official recognition as a discipline in the Soviet Union in the mid-1960s.

After proceeding through subsidiary ranks of "Senior Teacher" and "methodologist," a teacher might eventually aspire to an appointment at the top of the methodological tree as an "Honored Teacher of the USSR." Somewhat equivalent to being named "Teacher of the Year," the title brings with it the special economic plums (improved pensions, access to scarce imported goods, etc.) on which Soviet society often seems to run. The title, established in 1977, does seem to indicate some relatively high level of pedagogic expertise (or at least a high level of concern for their students' welfare).

The impression should not be given, however, that Soviet educators have met with nothing but successes in their attempts to encourage a wider use of technology in the schools. Indeed, the extensive efforts being devoted to improving the teaching methodology at the present time hints at the existence of deep underlying problems: boredom and disinterest on the part of students; uninspired teaching on the part of teachers; poorly organized and administered school systems in many parts of the country. (See Smith, 1976 and Kaiser, 1976 for some revealing anecdotal comments about the current state of Soviet education.) Such difficulties are rarely discussed in the Soviet press, but occasionally some candid comments do appear. Evdokimov (1973), for example, criticized the use some teachers make of media-as-entertainment:

> Unfortunately, there are cases in which educational technology is used only for an external effect. Then the use of technology turns into an end in itself, and the attitude of the pupils toward such a "spectacle" is most disrespectful and thoughtless.

Other Educational Technology Organizations

Organizations Working with the K-10 Schools. SHOTSO is not the only group in the USSR involved in educational technology on the national level. While it is responsible for the development of the technology to be used in the schools, there are other agencies which also play a role. The Academy of Pedagogical Sciences' Institute of General and Educational Psychology continues to devote considerable attention to such problems as programmed instruction and "algorithmization." And the Academy's Institute of Content and Methods of Instruction is involved in the specification and design of texts for individual subject-areas.

Organizations Working with Higher Education. There are also various groups working on hardware and software for use in higher education. Such materials and devices may be developed by the Ministry of Higher and Specialized Secondary Education's Institute for Problems of Higher Education, or perhaps by the Ministry's Special Design Bureau (Spetsial'noe konstruktor skoe biuro). In operation for 27 years, the Bureau is charged with developing such diverse materials as models, teaching machines, charts, laboratory gear, and special auditorium display arrangements (Nad chem, 1978).

The coordination of planning, production, and use of instructional television in higher education is carried out through a special Scientific-Methodological Council on ITV. The council's responsibilities also include the design and specification of standards for television facilities in institutions of higher education (Antipin, 1978). The production of films for use in higher education in the past was generally handled through a centralized service, USSR University Film (Soiuzvuzfilm); some institutions, however, have had problems in getting the services they needed and have begun to turn to other, non-university, film organizations such as Leningrad Scientific Film (Shamrai and Krasiuk, 1978). Finally, the increasing number of Soviet higher educational institutions and the complexity of meeting all their needs for audio-visual equipment were some of the factors apparently responsible for the creation of a centralized equipment production group, USSR University Equipment (Soiuzvuzpribor), in 1980 (Krasnov, 1980).

Other groups within the higher educational establishment which are involved in design and production work include various institutes, and universities themselves (especially polytechnical institutes, such as those in Kiev and Riga, and scientific institutes, such as the Moscow Energy Institute), together with research institutes concerned with cybernetics (which report to the USSR Academy of Sciences or to the smaller academies in the various union republics). These latter groups have been active in promoting the development of programmed instruction and of what are called "automated learning systems."

In addition to strong traditional foci on the use of films, television, and programmed instruction, Soviet higher education has recently witnessed a strong move toward the use of what might be called "static-dynamic displays." Using a variety of still media (slides, overhead transparencies, etc.), graphic materials representing a schematic view of a chemical formula or engineering process are presented on one screen, while film or television presentations displayed simultaneously on another screen illustrate the activity being summarized in the schematic (Koronatova, Nikandrova, Rau, and Khaliullina, 1976; Krasnov, 1980; Provada, chegodaeva, and Romanovskaia, 1980).

In spite of the high degree of centralization implied by the existence of so many country-wide production and design groups, the development of materials and equipment for use in higher education seems to proceed less systematically and more eccentrically than does that developed for use in general public education. Publication of editorials calling for the improved centralized production and dissemination of equipment, in such leading newspapers as Izvestia, testifies to the importance attached to such planning by Soviet educational leaders (Krasnov, 1976b). Likewise, such testimony is provided by the major exhibits of technological gear, which are staged in central locations (e.g., at the Moscow Exhibition of Achievements of the National Economy), and by the special programs which are conducted there for the administrative and teaching staff from higher educational institutions. At one such recent hardware display, some 150 specialized tours and seminars were held for the higher education community during the two weeks of the exhibit (Samokhvalova, 1980).

Unfortunately, the extreme specifications of Soviet higher education militates against the creation of equipment which can easily be adapted to a variety of situations. Many of the devices displayed in exhibits or discussed in journals remain "one-of-a-kind" examples or, at best, are parts of very limited production runs. Regular production of all but the simplest types of audio-visual equipment seems to sorely tax the Soviet industrial ingenuity; as in other sectors of the economy, shortages of parts and of skilled manpower to repair equipment are to be expected.

But the commitment of the regime to increasing the technological framework for both general K-10 and higher education should not be underestimated. Although the problems noted above are serious ones, so also are the achievements in this area impressive. The support for educational policies encouraging the broader use of technology comes neither from empirical data on the general effectiveness of media, nor from evaluative studies of the impact of particular programs, but rather from a simple, often-repeated set of value claims: "We **believe** that a technological approach is more stimulating for students, that it increases the effectiveness of education overall, that it frees teachers from routine and uncreative work, and that it is necessary for the future of education in our country. Therefore, we declare this to be the way in which education **should** be conducted." Value claims, however, will not by themselves change human behavior. For that, a more complex system of in-service faculty- and instructional-development programs is needed, and it is to this system that the next section of this chapter turns.

TEACHING THE CAT TO LIKE MUSTARD: INSTRUCTIONAL DEVELOPMENT IN THE USSR

"There are two ways to get faculty members in higher education to attend to the quality of their teaching," says M.K. Poltev, Head of Directorate of Qualification Raising of the USSR Ministry of Higher and Specialized Secondary Education. "The first is to handle them the way Peter the Great handled his nobles: order them to line up, and stand there with a scissors ready to snip off their beards as they walk by.[3] The second method is the way you teach a cat how to like mustard: you put a little on the cat's tail. At first, the cat doesn't like the taste but, being a naturally fastidious animal, it realizes that licking the mustard off will ultimately be in its best interest. After a while, the cat will come to not mind the taste, and in fact will eat mustard quite readily" (Poltev, Note 1).

This pair of droll analogies illustrates well the dilemma of instructional and faculty development in the Soviet context: on the one hand, the administrative bureaucracy of higher education is in a position to "compel" faculty members to use new methods of teaching, to update their expertise in their disciplines, and to improve their teaching skills. But while such an approach may produce impressive statistics for five-year-plan reports, it is not likely to generate willing, much less enthusiastic, compliance. For that, a less directive approach that appeals to the natural interests of the individual faculty member is called for. The system of "qualification raising" used in Soviet higher educational institutions includes elements of both approaches.

"QUALIFICATION RAISING" IN SOVIET HIGHER EDUCATION (FACULTY DEVELOPMENT)

"Organization of Qualification-Raising Programs." Some 500 "qualification raising" departments are located in the nation's universities and institutes; there are an additional 165 separate "qualification-raising" institutes attached to union- or republic-level ministries and other agencies and single "qualification-raising" courses are conducted by 400 smaller official groups. Some two million people participate in the "qualification-raising" program every year (Krasnov, 1979a).

Within individual higher educational institutions, a dean supervises "qualification-raising" programs and courses, and draws upon the established, older faculty members of the school who serve as mentors and supervisors for visiting faculty members. "Course" is a somewhat misleading term, for the "qualification-raising" system more closely resembles an arrangement of individual tutorials and managed independent study than it does a formal academic course. Some topics, notably teaching methods, educational psychology, and the use of educational technology, are frequently introduced in a large lecture held for faculty members from all fields, but most of the work is done independently.

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[3] Peter I, also known as "the Great," ruled the Russian Empire from 1682 to 1725. An intrepid "Westernizer," Peter first brought many contemporary European innovations to Russia--architecture, ship building, printing, and other applied fields flourished in new ways under his regime. One of his reforms involved the altering of the antiquated clothing and hair styles of the nobility so as to mirror those of the West, a change stoutly resisted by the nobles but rigidly enforced by Peter.

"Qualification raising" programs generally fall into one of three categories: (a) Specialty programs, for young or very inexperienced faculty members, are essentially further substantive work in the person's field. Such programs would likely involve the study of specific new content needed to complete or update one's knowledge of a discipline, perhaps with additional individual work conducted in conjunction with the senior faculty to enable the novice to see "what the field is." (b) Methodological programs deal with what Westerners would usually call curriculum: what subject-matter to stress in a course, how to pace individual units, how to integrate new subject-matter and so on. Questions of course design and some ID concerns would figure importantly in these programs. (c) Pedagogical programs deal with both nitty-gritty teaching skills and with broader questions of educational psychology, and with theories of perception and communication as applied to teaching in particular disciplines. The design and creation of new hardware systems, of new materials, or of course-specific instructional sequences would be included in pedagogical programs. Recently, the planned, rational use of educational technology has figured prominently in discussions of what content should be included in qualification-raising programs (Miseiuk, 1980).

The national coordination of the qualification-raising effort is handled through the Ministry of Higher and Specialized Secondary Education in Moscow. Within the Directorate of Qualification Raising, 11 divisions work on the problem, with five of these having a direct relation to ID and faculty development. These five include the division of Educational Film, of Instructional Television, of Educational Technology and Laboratories, of Faculty in Higher Education, and of The Scientific Organization of Education. (The last deals with many administrative problems, but also has devoted some efforts to the development of systems models for Soviet education--see, for example, Batyshev, 1972).

As is the case with the educational materials and equipment industry discussed above, qualification raising has been the target of intensive improvement efforts over the past decade. The USSR Minister of Higher and Specialized Secondary Education, V.P. Eliutin, noted the need to encourage faculty members to plan for teaching more carefully, and asserted that "the growth of technology has changed in a fundamental way the whole situation in higher education" (1980). N.F. Krasnov, First Deputy Minister and a frequent commentator on qualification raising and educational technology, urged the development of a stronger theoretical and empirical basis for the qualification-raising system (1976a, 1979b). And, as with all areas of life in the USSR, there are the ubiquitous Central Committee resolutions, reminding everyone involved of the seriousness with which these matters are viewed by the country's leadership (O dal'neishem, 1978).

The qualification-raising system has been in effect for several years now, and problems stemming from the system's maturity have recently become apparent to deans and other program administrators. Although qualification raising programs are in one sense individualized to meet the needs of each faculty member, the patterns in fact are apparently quite standardized, with each instructor's program looking much like everyone else's. And, since all of the faculty members are supposed to work through the system on a five-year cycle, there is concern that those coming back for their third round may become bored or dissatisfied because of repetition. Institutions have accordingly been advised to begin taking a more individualized approach toward program design (Semin, 1980).

Qualification Raising and the Faculty Member. The qualification-raising system is tied closely to the systems for faculty evaluation and for the use of sabbatical and leave periods. After a five-year probationary period, new faculty members are evaluated. Various types of evidence, including reports of classroom visits by department heads and colleagues and departmental recommendations play roles in this process. (Students' evaluative comments on their instructors' performances do not usually play a part in this process, although some higher educational institutions in the USSR have experimented with student course evaluations [Kusnetsova, Gavriushov and Korol'kova, 1976]

Although there is sometimes an outright denial of a continuing contract following a five-year evaluation, a more usual outcome is a recommendation that the faculty member either attend a qualification-raising program (to improve her/his teaching skills or to add to her/his theoretical knowledge of her/his discipline) or that s/he participate in a leave-cum-internship, or "stazhirovka" (to update her/his practical knowledge of the field). Either of these options may also be chosen voluntarily by more senior faculty members, who in any event are obligated to undertake four months of either leave or qualification raising every five years (Semin, 1980).

Before embarking upon either a leave or a qualification-raising program, the faculty member and her/his department head may draw up an agreement specifying what the faculty member will accomplish during this time (Gorshenev, 1978). Faculty members interested in materials design would likely either arrange a program at an institution where such materials are regularly created, or perhaps work out an "apprenticeship" with a known developer at a major institution.

Qualification Raising on the Local Level. It may be valuable to examine briefly a number of specific cases of how qualification-raising programs and ID-type activities are handled. At the Moscow Energy Institute (one of the institutions examined by American educator Bryce Zender in the late 1960s; Zender, 1972a), the qualification-raising programs enroll some 300 participants from other higher educational institutions each year. Each participant develops a plan which includes about 36 hours of in-class lectures and 26-28 hours of out-of-class exercises, leading to a "graduation project." Some of these projects (eight during one semester in 1978, for example) focus upon improving the participant's use of educational technology in teaching situations. Each program also involves the presentation of lecture "fragments" to peers for their critique, combined with feedback from their peers on the quality of lecture materials and handouts (Grigor'ev and Danilov, 1979).

A similar program is conducted at Kazan University, which includes required practice in the use of educational technology and which allows the optional selection of that area as a topic for projects (Shurtakova, 1979).

The qualification-raising program at the USSR Machine Construction Institute is based upon what Western educators would probably call a "lab" system. A variety of self-instructional materials, reading lists, and audio-visual equipment is provided in a separate room. Qualification-raising participants are encouraged to use the equipment and to engage in group consultation exercises under the direction of special instructors who are assigned to the lab. Participants also use the lab to create their own teaching materials (Perfilov, 1979).

Soviet educators also stress the value of qualification raising for new faculty members and graduate students who are on their way to becoming faculty members. At the new Brest Construction Engineering Institute, all 400 faculty members managed to participate in qualification-raising programs during the first five years of the institute's existence (Belogortsev, 1978). And the Briansk Transport Equipment Construction Institute offered a program for its graduate students on "Teaching in Higher Education." The course required students to attend lectures and seminars, and also involved "methodological" exercises (lecture planning) and "pedagogical" exercises (designing lab instructions or student assignments) (Bulgaev and Lagerev, 1979).

Although there have been official pleas for a more compehensive theoretical and empirical knowledge base for the support of qualification raising, most of the content seems to be purely applied. One of the few Soviet educators who is working on a learning theory which might provide more of a depth in theory is V.P. Bespal'ko, who has proposed a hierarchy of learning types and a system for matching instructional variables with each of the levels of the hierarchy (1977).

Problems with the Qualification-Raising System. But while the qualification-raising system seems admirably efficient and well-designed, there are occasional hints that it does not work as perfectly as the official statements would have one believe. It is apparent, for example, that university faculties are not overwhelming Soviet media centers with demands for equipment. If the demand were high, there would be no need for the Higher Education Courier (the only journal on higher education in the USSR) to publish, month after month, a series of articles under the heading "Use Educational Technology More Widely!" And, if all faculty members are **supposed** to participate in qualification raising every five years, why is an institution celebrated so thoroughly in the press when it actually meets this goal? The real level of faculty participation, one may infer, is probably far lower.

V.I. Zuev, a teacher at the USSR Institute of Economics and Finance, discussed the institute's qualification-raising program (a "lab" system not unlike that at the Machine Construction Institute), and also provided a rare candid glimpse of the problems of qualification raising in action.

> The creation and operation of an education lab in higher education is a difficult process. In particular, we had to overcome a psychological barrier that hindered many teachers from using contemporary educational technology more widely in classes.

Demonstration lectures using educational technology and computers, he suggested, may provide an effective way of dealing with faculty resistance (Zuev, 1979).

The Tashkent Polytechnic Institute tried another method for kindling faculty interest in the use of educational technology. After the Institute's Methodological Council proved unable to spur sufficiently high interest in new teaching methods, the administration arranged a yearly contest in which departments competed with one another. Departments won points for such things as the number of classrooms retrofitted for the use of educational technology, the number of times such halls were used, the number of teachers actively using media, the number of films shown, and so on. Departments were also "fined" points for not using the equipment they had on hand. All this apparently helped "pervade the entire educational process with educational technology" quickly and on a broad scale (Kulikov and Shustrov, 1979). The authors do not say, however, if the new policy promoted the sort of rational and carefully planned use that higher education officials have been demanding lately.

Other ID-Type Organizations

In addition to the massive national qualification-raising system, there are several organizations which are concerned with ID issues in other ways. Three of them bear mention here: the Young Lecturers Schools; the Institute of Problems of

Higher Education; and the Scientific Organization of Educational Work movement.

Young Lecturer's School. Many universities initiate their own courses for young faculty members under the title "Young Lecturer's School" ("Shkola molodogo lektora") or "Educational Improvement School" ("Shkola pedagogiches-kogo masterstva"). Such courses include sessions aimed at increasing the faculty member's level of awareness concerning the importance of teaching and of teaching improvements. There is some evidence, however, that these schools may serve as vehicles for socializing new faculty members in terms of the political and ethical climate of Soviet higher education through the heavy emphasis placed upon political content; two authors indicate that one of the main reasons that faculty members attend such schools is to enable them to become more effective "propagandists for Communist ideas" (Boleev and Moldakasov, 1979).

The Institute for Problems of Higher Education. The Moscow-based Institute for Problems of Higher Education (NII vysshei shkoly) has two departments which deal with teaching research and improvement: The Department of Scientific Organization of the Teaching Process, and the Department of Theory and Methods of Instruction. Within the former, separate sectors are concerned with Educational Film and Television, with Instructional Systems, and with the Planning and Control of the Teaching Process. Because the institute was recently formed (in 1976), its research and development programs are just now beginning to come to fruition.

Scientific Organization of Pedagogical Work. Another important factor related to ID in the Soviet context is the movement toward increased pedagogical efficiency known as the "Scientific Organization of Pedagogical Work," or by its Russian acronym "NOPT" ("Nauchnaia organizatsiia pedagogicheskogo truda"). An outgrowth of a more general, long-standing Soviet school of thought known simply as "Scientific Organization of Work" (or "NOT"), NOPT is concerned with defining efficiency standards, promulgating them, and measuring the results. NOT had its origins in the Taylorism popular in the United States earlier in this century. Recently, both NOT and NOPT have come more to the fore as Soviet social scientists have begun to apply more quantitative measures to their analyses of the workplace (see Lieberstein, 1975, and Fleron, 1977, on the development of NOT in the USSR).

The NOPT movement is perhaps best illustrated in the works of I.P. Rachenko, an educator and psychologist who founded a NOPT laboratory in Piatigorsk in the late 1960's. Rachenko, himself a prolific writer and developer, defined NOPT as the coordination of four key elements: (a) the process of teaching and upbringing; (b) the quality and preparation of teachers; (c) the role of parents and others who are in contact with the student; (d) the material and technical bases for instruction (Rachenko, 1972). Other of Rachenko's studies investigated teachers' feelings of competence or incompetence with regard to specific teaching tasks (lecturing, leading discussions, grading essays, etc.; predictably, confidence went down swiftly as teachers moved into non-lecture activities). In another study, he examined student learning outcomes and related these to teacher participation in a variety of qualification-raising courses. Batyshev (1972) also devotes considerable attention to the role of technology in encouraging NOPT.

This focus upon systematic planning is relatively new in Soviet higher education, and it seems to have been adopted with more enthusiasm by administrators than by their faculties. As more computers make their way into Soviet life, the number of references in higher education publications to "automated management and control systems" is bound to increase.

SOVIET AND AMERICAN EDUCATIONAL TECHNOLOGISTS' MUTUAL MISPERCEPTIONS

As this paper draws toward a close, it makes sense to ask what educational technologists and instructional developers both in the USA and in the USSR know about each other's work. The reason this makes sense is because there may be ways in which each group could learn from the other, and because present opportunities to do so are very limited.

American interest in Soviet educational technology has not been overwhelming. A number of technical reports were published in the 1960's following the launching of Sputnik I and the concomitant fear of Soviet educational superiority (e.g., Schultz, 1964). Zender, an American educator, spent some time as a graduate student in the USSR in the late 1960's and focussed heavily upon the Soviet move toward programmed instruction (1970, 1972a, 1972b). And a dissertation by Mozes (1979) explored in depth a number of the more recent developments in Soviet educational technology. Publication in English of works on algorithmization by Landa (1974, 1976; formerly of the Academy of Pedagogical Science's Institute of General and Educational Psychology) and on computers by Berg (Zender, 1975) has brought some Soviet efforts to the attention of Western educators.

And what do Soviet educational technologists know of American efforts? Conversations with members of various institutes and information from a few published articles show that they are somewhat aware of what is happening outside of their own country. What they seem to admire most about education in the United States is the technological sophistication of the equipment which is so widely available. An exhibit in Moscow in 1973 which included products from U.S. and West European manufacturers, drew rave reviews from a

Soviet visitor (Piskunova, 1974). Other Soviet writers, however, have cited studies showing that ghetto schools in the U.S. are less well equipped than are suburban schools, thus "proving" once again the Marxist hypotheses about the exploitative nature of capitalistic society (Il'ina, 1971).

Most puzzling for Soviet educators is the strong focus upon objectives in American educational technology (Kosmodem'ianskaia, 1973; Pressman, 1979). This is perhaps understandable for educators who have spent all their professional lives in a system in which objectives are defined near the top of the educational hierarchy and in which relatively little latitude is left for the individual teacher. What interests them in American research and development is work on learning theory, hierarchies of learning and instruction, the teaching of thinking skills, and cognitive information processing. These, in the Soviet view, are all inextricably linked to the improvement of instruction.

As far as this author knows, no one has ever conducted a joint American-Soviet research or development project in educational technology. While current political problems make such ventures difficult to arrange, it would seem that there might be benefits for each side: Soviet educators would gain insights into the systematic planning and design processes at which the United States seems to excel, and they would also likely be interested in current work being conducted in cognitive development and the use of media. American instructional developers have already shown an interest in the work Soviet researchers have done on algorithmization, and it would seem that they could also benefit by studying the Soviet research style with its use of more naturalistic settings and its greater concern with processes as opposed to outcomes.

INNOVATION ON COMMAND? THE DIRECTION OF INSTRUCTIONAL DEVELOPMENT IN THE USSR

The Frame of Analysis

There is a temptation, in trying to assess the overall impact of the Soviet instructional development program and the probability of its future success, to apply what we know from our own experience in the West. A reasonable approach, for example, would be to take those perspectives on innovation in educational systems developed by such researchers as Rogers and Havelock, and use them to chart the processes by which the Soviet ID program has been prepared, promulgated, accepted, or resisted. Using this approach we might conclude that the Soviet effort has been clumsy and ill-fated on several counts: there seems to have been little participation by affected parties in determining the scope or the content of the program, for example, and there is little opportunity for local adaptation or modification of the changes proposed by the national system. Other conditions supposedly helpful to the adoption of innovations are also absent.

But to use this sort of framework for a concluding analysis would be simply to don a set of cultural glasses that may focus attention on what are, in fact, insignificant features of the ID-innovation process when it is conducted within a context such as that of the Soviets. Broad public participation in policy making has never been a characteristic of either pre-revolutionary Russia or of the Soviet system. Yet, Western scholars now seem more convinced than previously that policies in the USSR are not made in an information vacuum--there are ways in which groups formulate and express their interests on important matters before and after decisions are made (Hough and Fainsod, 1979; Skilling and Griffiths, 1971. For discussions of the ways in which special-interest groups act with respect to educational decisions, see Bruce, 1976, and Kerr, in press). To fault Soviet ID programs for apparently not involving higher educational faculty members in goal setting, then, would be inappropriate, for the views of that constituency have likely been taken into account in some fashion, although probably not in the same way to which Westerners would be accustomed. What is needed is an analysis which examines the programs and their potential within their own contexts.

SUMMARY: THE SCOPE OF SOVIET ID

This chapter has considered the creation and growth over the past decade of an intensive, two-pronged effort in instructional development in the USSR. One part of that effort has been substantial investment in the design, production, and dissemination of both the materials and the equipment of educational technology, combined with a sometimes strident campaign to encourage educators to use these resources. The second part of the ID push has been a striking expansion of the program of qualification raising, a program designed to help faculty members in higher education to expand their repertoires of teaching styles and to create a system of higher education which is both minimally satisfying to students and maximally productive for the national economy and society.

The Educational Technology Program. During the past decade, the Soviet educational establishment has taken massive steps in equipping educational institutions at all levels with basic audiovisual equipment. Overhead projectors, film and filmstrip projectors, TV systems, and a variety of programmed instruction devices are now much more widely available than they were ten years ago. While their design would seem plain or even primitive to Western eyes, their presence in Soviet classrooms is hailed as an achievement and is viewed as a significant contribution to more effective teaching and learning.

Likewise, the software to use with the new technology, if not yet commonplace, are at least no longer the remarkable rarities they were earlier. Too, significant numbers of educators, especially in higher education, are apparently becoming involved in the design and development of materials.

Finally, teachers are encouraged through newspapers and journal articles, and through a variety of pre- and in-service training programs, to use the new technology carefully and intensively in education. The high level of energy which continues to be expended in this campaign, however, suggests that there may be more than a few laggards.

The Qualification-Raising Program. Especially in higher education, faculty members are expected to spend three or four months very five years in a qualification-raising program. While these programs (similar to contracts involving faculty members and their departments) involve heavy doses of basic theory and application within the participant's discipline, they also include the study of materials on teaching skills, systematic lesson or lecture design, and the use of educational technology.

The success of these programs is hard to judge accurately. The volume of participants is high, but the content often appears to be extremely discipline-specific and may involve a good deal of basic up-grading of the participant's knowledge of her/his field to enable faculty members from regional institutes to provide at least a modicum of up-to-date information to their students.

THE FUTURE OF SOVIET INSTRUCTIONAL DEVELOPMENT

What factors act to help and hinder the Soviet ID program as it moves into its second decade? Several have been noted throughout the present discussion, but it makes sense to recapitulate these with an eye toward their projection.

Popular Enthusiasm for Science and Technology. Certainly the enthusiasm for science and technology which infuses Soviet life bodes well for the future of ID in the USSR. The NOPT movement and the heavy focus upon automated learning systems and automated management systems are genuine expressions of an interest which goes beneath the level of propaganda. There is a fascination for the new and the technical that Soviet hosts often inflict unabashedly upon their Western guests, taking them to see only the latest, the newest, the best-equipped schools and classrooms. Russians, like Americans, are often tinkerers and gadgeteers, and this approach spills over into education.

The Possibility of Centralized Command. In a centralized society, decisions can be made, institutes created, resources committed and programs developed on a national scale without extensive prior public debate. Local curriculum development problems are largely eliminated when curriculum is essentially equivalent across the country. Also, the peculiar nature of the Soviet political reality militates against any strong criticism once a program is in place (although clearly unsuccessful programs may be withdrawn, also without public discussion). The obviously strong intention of the regime to implement the ID program--an intention apparently based upon assumptions concerning the usefulness of educational technology and of the qualification raising program which are founded upon normative rather than empirical value claims--will allow it to move ahead rapidly in this field. Similarly, academics who know that their success in obtaining tenure, advancement, and (more importantly, within the Soviet context) the material comforts which the state provides its favored performers, are dependent upon their participation in the ID system will be likely to give that system at least its minimal due.

The Impossibility of Centralized Command. On the other hand, there are a number of ways which the Soviet system hinders the programs it would like to carry out. Bureaucratic in-fighting in the educational establishment is, if anything, fiercer than it would be in the West because of the lack of open discussion and of access to information. The extreme specialization of the Soviet higher educational system seems to exacerbate this problem. This leads to inefficiency in implementing the ID program. The large numbers of union-level advisory councils and production boards established over the past few years as may well be the frustrated regime's attempt to encourage greater inter-institutional cooperation. Whether more bureaucracy can cure bureaucratic problems is open to question, but past Soviet (or American) experience casts doubt upon this proposition. Bureaucratization, then, may slow the implementation of the ID program in the USSR.

The Traditions of Higher Education. It must also be borne in mind that the Soviet higher educational system is much more like the nineteenth-century European system than it is like the twentieth-century systems of either Europe or America. Lecturing is still a much stronger norm for Soviet educators to break than it now is for their Western counterparts. Also, Soviet academics (especially those holding the scarce titles of "doctor" or "academician") are held in considerably higher esteem among the general populace than would be the case in the West. (A series of surveys conducted between 1966 and 1975 showed that professions such as "mathematician," "physicist," "engineer," and other roles in the "creative intelligentsia" were ranked by young people at the top of the Soviet prestige scale; Titma, 1975).

The combination of strongly traditional professional norms and high prestige means that Soviet teachers are to some degree immune from demands for change. Their prestige allows them to point to current practices and say, in effect, "look at how highly the public regards our work; we must be doing a good job." While the regime can order, coerce, and cajole in many areas, it apparently is not willing to incur the wrath of academics on a broad scale by forcing compliance with the ID programs, and will likely continue to depend upon less direct (if sometimes unsubtle) methods for encouraging change. This combination of factors, then, may act as a brake on the spread of ID in the USSR.

CONCLUSION: THE LIKELIHOOD OF A SLOW ADVANCE

The varied forces described above are not in balance. The Western observer would likely give the Soviet ID system only small odds for making a dramatic impact upon Soviet education in the next decade, because the easy advances--the equipping of classrooms with basic hardware and materials--have now been accomplished. What remains is a process of convincing and persuading which will require a considerable administrative sophistication, and many have found the ability to do this to be lacking in Soviet enterprises.

But these problems may not be visible to Soviet educators for some time. The greater availability of educational technology and the willingness of the regime to subsidize qualification raising on a regular basis are such notable improvements over the system as it existed a decade ago that problems inherent in the current system may appear small to those affected. Should teachers in the USSR themselves request ID services which match popular conceptions of technology, services which also respond administratively in a flexible fashion and which provide for the unique position of educators in Soviet society, and if the regime is able and willing to provide and adequately support such a system, then we may begin to see realized the potential for improvement the Soviet educational system is capable of, building upon the present system of instructional development as a foundation. Until that time, the system will remain impressive, but flawed.

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B. MILITARY

Chapter 37

Educational Technology in Military Training Applications: A Current Assessment

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Dee H. Andrews

Many developers work for the military, and many more projects contracted for by civilian companies. It is likely that in the future, the manpower base for the military ID effort will be greatly expanded.

Further, many of the most sophisticated developments in educational technology are occuring in the military. And, many of the best examples of what not to do in ID are to be found in the military.

For these reasons, all developers can benefit from a greater understanding of ID in the military. The present chapter discusses the history, the present status, outstanding accomplishments, problems, and the future, of ID in the military.

INTRODUCTION AND BACKGROUND

The Department of Defense (DOD) now spends more than seven billion dollars annually on training and educational opportunities. Fifteen to twenty percent of the three million military and civilian personnel in the DOD are normally involved in training programs at any one time (Rose, 1976). Given this tremendous expenditure of resources, and the defense responsibility which the DOD bears, it has become imperative that the military define and overcome the training challenges which it faces.

The achievement of an effective national defense is generally accepted as being a worthwhile goal. However, developing the means for training the forces necessary to operate sophisticated weapons systems has caused much frustration and has resulted in considerable controversy. It is clear that technical-specialty training has emerged as a significant challenge to the Department of Defense (Ebel, Noll & Bauer, 1969).

A variety of factors have contributed to military training difficulties. Among them are a decrease in reading skills (Duffy & Nugent, 1978; GAO, 1977), persistent motivation problems (Naval Technical Training Command, 1977), high personnel turnover (Dougherty & O'Neill, 1978), and a large increase in the technical sophistication of weapons and communication systems. The complexity of modern weapon systems requires not only higher levels of competence on the part of operators, but also a vast technical-support establishment concerned with system maintenance. An integral part of both operational and maintenance readiness is the training sub-system.

It is possible to both praise and criticize

The authors wish to express their appreciation to Charles A. Beagles for review of this chapter. The opinions and viewpoints expressed in this chapter are those of the authors and do not necessarily represent those of the Department of Defense.

government efforts in the area of military training. The scope and complexity of activity is so diverse that examples can be found supporting almost any point of view. This chapter shall examine just some of these accomplishments, general problem areas, and future trends. Emphasis shall be given to attempts to implement educational technology and systematic instructional development procedures as a means for improving the effectiveness of training.

No formal definition of educational technology can be found which is accepted throughout the military training community. The authors, however, define educational technology in the broadest sense. That is, it is more than merely the hardware of training (e.g., computers, and television). In addition, educational technology includes all of the planning, designing, evaluating, and revising necessary to bring a training system to an adequate level of effectiveness (Association for Educational Communications and Technology, 1972). Unfortunately as this chapter will point out, the broad definition for educational technology described above is not always understood or used in military training.

The effort currently under way to improve military training encompasses a variety of the same challenges which are faced in non-military settings. Questions concerning human factors research, task analysis methodology, description of learning objectives, effectiveness measurement, and many other areas are being encountered and grappled with on a day-to-day basis. As an active test bed for educational technology the DOD presents great opportunities for growth. This chapter will not only provide constructive criticism, but will also explore the unprecedented challenges which await those working in military training. The chapter is basically intended for those readers who are familiar with the principles of educational technology, but who are not aware of the contributions which the military training community has provided to the field. It is hoped that the lessons learned from the application of educational technology principles to DOD training will be of benefit to those professionals who are laboring in other areas of education. The authors rely wherever possible upon the results of formal studies; however, some points in the chapter are based upon conventional wisdom, common sense, and personal experiences.

CURRENT METHODS AND PAST ACCOMPLISHMENTS IN MILITARY EDUCATIONAL TECHNOLOGY

The military establishment turned to educational technology as one means for meeting the challenges (i.e., training requirements which outstripped the growth of training resources) discussed in the previous section. A variety of processes and products resulted from the many efforts in the DOD training field. It is not possible in this brief chapter to review all of the contributions of military training to the field of educational technology. Therefore, this section will briefly highlight five key accomplishments by the armed services: the development of an inter-service instructional design model, the establishment of Instructional Program Development Centers, the large-scale development of exportable training packages, the implementation of individualized training, and training device development.

An Inter-Service Instructional Design Model

The Air Force assumed the lead, in the DOD, in the development and use of a systems-approach model for instructional design. In the late 60s the Systems Approach to Training (SAT) was developed. While systems methods of instructional development had been in existence in the military since the 1950s (Montemerlo, 1975), SAT's implementation represented the first time that an entire service had required all of its training activities to use the same model. The idea was that a great deal of redundant instructional development could be eliminated once all activities used the same procedural model. Experience in the production of instructional materials had shown that each Air Force training command had been approaching the effort in a variety of different ways. For example, one activity would not use materials developed by another. This "not-invented-here" syndrome, common to both military and non-military settings, was believed to hamper training effectiveness. The Air Force, realizing the harm in this situation, pushed hard to establish an instructional development approach which could be used service-wide.

The SAT contained all of the elements educational technologists had become accustomed to seeing in a design model (front-end analysis, objective derivation, media selection, instructional development, evaluation, etc.). Once this service-wide model had been established, improvements in many areas of Air Force training were noted: orderliness, completeness, relevance, economy, documentation, and evaluation all improved. (Sugarman, Johnson, Hinton & Buchemaier, 1975). The communication between the Air Force schools, the Air Force civilian training centers, and the contractors who developed much of the training material and media benefited greatly. Better training was the result.

The other military services took note of the Air Force experience. While these organizations had experimented with their own instructional design models (e.g., Systems Engineering of Training, Training Situation Analysis), the effectiveness of the efforts had been inconsistent. This was thought to be largely due to the fact that a variety of design models had been developed and used by different sectors of these services. There was no unified model, after the Air Force fashion, in any of the other services.

The Air Force's success prompted the development of a joint instructional design model

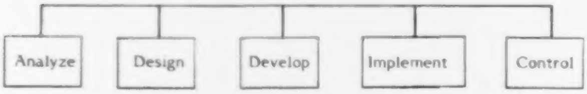

Figure 37-1. The five phases of the interservice procedures for instructional system development.

which could be agreed upon and used by all of the services. The model was ready for service-wide use in 1975 and became known as the Interservice Procedure for Instructional Systems Development (IPISD) (Branson, et al., 1975). This model has five main phases: Analyze, Design, Develop, Implement, and Control. Their relationship is displayed in Figure 37-1.

Within each phase there exists a number of distinct steps, each designed to move the model's user closer to finished products which are training effective. An excellent review of the model's development and use can be found in an article written by the model's prime developer (Branson, 1981).

The Air Force's success with the SAT convinced the other services that it was possible to develop a generic instructional design model which could apply to all military training. One service led the way, and in a rare show of unity the other services followed. However, agreeing upon one model proved to be easier than fully implementing that model. The difficulties encountered in the implementation attempt will be the subject of the "Problems" section of this chapter. The Navy developed a method of implementation which could have far reaching effects upon all of educational technology. That method will be the subject of the next section.

Instructional Program Development Centers

One of the Navy's main contributions to the field of military educational technology has been the concept of the Instructional Program Development Center. These centers, which are placed at key naval installations throughout the country, are staffed mainly by civilian instructional developers who carry out the detailed process of implementing the procedures called for by the Interservice Procedures for Instructional Systems Development described above. Specialists in such fields as task analysis, instructional design and media development, produce instructional materials for use at Navy schools. These centers develop products both in-house and under contract (Hodak, Middleton & Rankin, 1979).

The establishment of the Centers was spawned by the greater-than-anticipated difficulty of military instructional staffs at the formal schools to successfully produce instructional materials when using the IPISD methods. At least two factors may be responsible for this failure. First, the instructors often lacked the skills necessary to properly make use of the model. An instructional development model is just that--a model. A certain degree of flexibility is required in its use. Some steps may be combined or deleted, or extra steps may be added, depending upon the circumstances of the particular instructional project (Andrews and Goodson, 1980). In order to know which actions to take with a model like the IPISD model, at least some training is required in its use. Often the training provided instructors (Branson, 1978) proved to be insufficient for the development task; not because the training itself was poor, but rather because of the extremely high rate of instructor turnover. New instructors could not be trained fast enough. In essence, many instructors were often left to their own devices to operationalize the IPISD principles. Consequently, both the quantity and quality of instructor-produced materials left something to be desired (Montemerlo, 1979).

The second factor that caused the IPISD model to be difficult to fully implement at the school level related to the time it takes to accomplish any systems approach to instruction. The instructors often could not find the time to devote to the effort, given the many duties which they were required to perform (teaching, administration, inspections, etc.). IPISD development often took a back seat when weighed against other priorities. A statement made by Ansbro (1978) succinctly summarizes the problems: "It is simply asking too much of the instructor-jobholder to require or even expect versatility and solid competence throughout the range of instructional support duties commonly allotted to him. Can he reasonably be expected to write and revise lesson plans (published, official); compose, revise, and evaluate test items; devise or revise training aids; counsel and tutor trainees; and also perform ably as a platform lecturer and/or a "learning supervisor" in a self-paced or Cathode Ray Tube classroom environment?

In summary, the Instructional Program Development Centers have shown the potential of being a valuable addition to the Navy's capability to produce quality instructional materials. Despite some difficulties (e.g., initial difficulty in properly staffing the centers, difficulty in accurately estimating required funds, initial difficulty in achieving full participation of fleet operational personnel in the program), the centers have gone a long way toward easing the strain on instructional staffs (Scanland, 1978). Their continued use by the Navy should help to further develop the concept of a "team approach" in instructional development (Carey and Briggs, 1977).

The Navy requires all of its Development Centers to use the IPISD model when designing and developing instruction. The Army also makes the same requirements of its instructional developers, and one major result has been an approach to training which can be utilized in almost any environment. That approach will be the topic of the next section.

Training Extension Courses

One of the Army's key contributions has been the Technical Extension Course (TEC) concept. These courses, of which over 2,000 had been produced by 1981, are fully exportable, self-contained instructional packages on a variety of topics. They are produced using the IPISD guidleines and generally use one of three delivery methods: Bessler Cue-See film projection system, audio tapes, or programmed instruction (Hanselmann & Perlman, 1981).

The Army came to the conclusion in the early 70's that many of its soldiers were not keeping up with advances in their specialties and required more training than they were getting in the formal Army schools. In addition, a great need for refresher training was realized.

Sending rather dry technical manuals to the soldiers in the field did not seem to be a satisfactory solution to the problem, due to their generally low motivational value. In addition, IPISD principles were not reflected in those technical manuals. Army training leaders decided that a large library of lessons was required for specialty training (both initial and refresher) which could be used in scattered and often remote locales throughout the world.

It was apparent that IPISD principles should be used for the design and development of the TEC lessons. However, defining the most suitable delivery tool took some effort. After examining a variety of possible instructional media choices, the decision was made to use the Bessler Cue-See system as a primary delivery tool, along with audio tapes and programmed instruction. The Cue-See system uses a self-contained projection method which allows film to be shown in still frames, or for instruction which required motion, in moving frames. The film and sound can be stopped so as to permit the student to answer questions or perform a task; then the student can reactivate the lesson. The projector is a compact, sturdy system which normally requires minimal maintenance and can be used in many environments (Arctic, desert, tropical, temperate, etc.). This TEC system has proven to be an excellent method of taking quality instruction to the field. Audio tapes are used for instruction when conditions do not allow the use of the Cue-See (by a soldier who is repairing a jeep, by a soldier who is on maneuvers, etc.).

The Army Research Institute has evaluated the training effectiveness of the TEC program and found that this method taught the lessons more effectively than did conventional instruction, led to better retention, and cost 16 percent less than did traditinal instruction. In addition, TEC surveys have frequently shown a positive attitude toward the entire program.

The instructional packages may include technical manuals (or simplified versions of them), tests, the Cue-See film packages, audio tapes and programmed instruction. Presently they are being used throughout the world. The Army is now investigating the use of video-disc as a replacement medium for the Bessler Cue-See.

The TEC lessons represent a use of educational technology on a wide scale which combines advanced media with systematic instructional design. They make use of the individualized instruction approach to training, a concept which has had a large impact upon military training. This impact will be the topic of the next section.

Shift to Individualized Instruction

One major aspect of educational technology which all of the services have agreed upon and attempted to implement has been individualized instruction. The military has set minimum standards for intellectual and academic requisites. It is normally expected that recruits will be high school graduates and be able to read at least at the eighth grade level. (The end of the draft in the early 70's caused a decline in number of recruits with even these minimal qualifications). There is, as one might expect, a great deal of variability in the quality of the recruits who enter the service. (Once again, the end of the draft saw a reduction in the overall variance, as potential recruits with high qualifications tended to stay away from military service). This variability caused many problems in military schools when group-paced approaches were used. The same problems which are troublesome in group-paced public schools and colleges also were apparent in these military training schools. Boredom for high achievers, bewilderment for low achievers, and frustration for instructors became quickly apparent. Due partly to these reasons, military personnel who graduated from lockstep schools often lacked the skills and knowledge required of them in their military duties. Maintenance requirements sometimes went unmet, weapons operators sometimes were unsure in their tasks, and total military preparedness ultimately suffered. The armed forces were finding such occurrences at a very alarming rate when group-paced approaches were used. Certainly, the group-paced approach was not the only reason for these training problems, but it was thought to be a significant contributing factor.

The slow learners suffered more than the rest because the pressure to get them graduated and out of the schools was great. Reducation in total manpower required every available person to be quickly placed in operational units. In addition, new classes of students coming into the schools did not leave any space for previous students who had either failed classes or merely needed extra help. The group-paced assessment systems were often not performance-based and consequently did not allow the instructional staff to identify students who were not truly adept at the required skills. This made remediation all the more difficult.

In order to counter the problems cited above, the military turned to individualized instruction. These methods, now used in most military training schools, have allowed instructors to focus upon students who are having trouble. Individualized instruction has also fostered the development of performance-based assessment approaches. As Montemerlo (1975) points out, the military operationalizes individualization by making use of proficiency-based advancement within the course, and proficiency-based graduation from the course.

The use of individualized instruction does not mean that the military has abandoned traditional instructional methods, such as lectures. Nor does it mean that group-paced classes have been entirely done away with. It does represent, however, a significant advance in military training thinking which has allowed the needs of the trainee to be better defined and accommodated (Zajkowski, et al., 1979).

A variety of techniques for administering individualized instruction have been explored. This chapter has already reviewed the TEC method. The next section will explore an additional method--the simulation training device.

Military Training Devices

In the early 1940's an innovation came upon the training scene which has had considerable influence upon military training and has grown into a multi-billion dollar industry. That innovation was the Link simulator for pilot training. Here was a device which allowed initial training and practice in flight training in a safe environment, at a relatively inexpensive cost. As the requirement for hugh numbers of pilots became more acute, the military turned increasingly to this simulator. It allowed a trainee to make his first real flight with considerable knowledge and skills in aviation already at his command. Thousands of pilot trainees made use of this training device.

Since the early Link trainer, simulators of all kinds and varieties have been used by all of the services. Simulators have been developed for maintenance training, weapons operation, tactical training, team training, and many other uses.

Simulators have a variety of benefits which are being increasingly realized by military decision-makers. Some of the advantages are listed below:

- Simulators usually cost considerably less than the operational equipment they replace.
- Simulators are safer than operational equipment
- Simulators provide more hands-on practice than operational equipment will allow. (This feature allows increased capacity for individualizing instruction. Slower learners can spend more time on the device.)
- Simulators are usually easier to maintain than are operational equipment.
- Use of simulators frees operational equipment for use in the field.

One very important advantage that accompanies simulator use is the special training functions available with them (e.g., the capability to freeze and play back training sessions, diagnostic recordkeeping, easy malfunction insertion, and automatic comparison of trainee performance with criterion performance). Operational equipment seldom can be adapted to include these functions.

The military is increasingly coming to realize that just building a simulator which exactly looks like and duplicates all of the functions of the operational equipment will not necessarily produce better training. Requests have been frequently voiced in the past, by personnel in the field, that the simulator have "high physical and functional fidelity" with the operational equipment that it is stimulating. While this high fidelity is "nice to have," it can be expensive to obtain and may add nothing to the training effectiveness of the simulator (Gagne, 1971).

More important to training than is "physical and functional fidelity" is "psychological fidelity." This term may be defined as being the various cues which prompt student behavior in a training setting. In order to achieve the maximum amount of transfer from the training situation to the real world, a detailed analysis of the various stimuli and responses inherent in the task is necessary. Once these psychological task components have been defined, they can be incorporated into the training device. This incorporation is often not possible when high physical and functional fidelity is demanded, because the operational equipment is built with the requirement that an expert operate the equipment. The operational equipment does not make allowances for novices who are not able to recognize all of the cues and to display all of the proper behaviors. Consequently, when a simulator reflects the exact appearance and function of the operational equipment the trainee, who is not an expert, may not be able to recognize the cues or respond with the appropriate behavior. Psychological fidelity of the simulator with the operational situation is often not obtained.

As the instructional features mentioned above, such as feedback and record keeping, are incorporated into simulators, the simulators become "training devices" whose primary purpose is to provide training by means of psychological fidelity. The adoption of this concept by the military represents a major breakthrough. What is needed for effective training are "training devices" which present appropriate psychological cues for novices. Merely producing simulators is usually not sufficient for training purposes. Technological advances have made these devices possible, and they are being exploited more and more by every branch of the armed services.

Summary of Accomplishments

This brief discussion has examined but five accomplishments that the military community has achieved. The development of the Interservices Procedures for Instructional System Development model, the establishment of the Instructional Product Development Centers, the success of the Training Extension Courses, the military's progress in individualized instruction, and the use of training devices all represent examples of the DOD's commitment to educational technology. These advances have not come without problems, which will be the topic of the next section. However, despite these difficulties the military has been a viable team member in the development of the field of educational technology.

PROBLEMS ENCOUNTERED WITH EDUCATIONAL TECHNOLOGY APPLICATION WITHIN THE DEPARTMENT OF DEFENSE

The armed services have been at the forefront of educational technology development since the inception of the field. The DOD has contributed a considerable amount of the total growth to educational technology, as discussed in the previous section, and in turn has reaped many significant benefits. However, as is the case with any pioneering effort, problems and limitations have surfaced when educational technology applications to military training have been seriously examined. Such is to be expected when a set of innovations of such proportions is applied to a large organization such as the military. These problems have not resulted in the military's abandonment of educational technology. On the contrary, the advantages of using this technology have been much too apparent for such an action to be warranted. Rather than abandonment, a continued effort in the identification of problems and problem-solutions has resulted.

Identification and discussion of these difficulties is necessary if further progress is to be made. It is vital that weaknesses in the military training system be pointed out. Such is the purpose of this section. This discussion of problems is intended to point out significant challenges which, if fully met, could have a far-reaching impact upon the state-of-the-art in educational technology not only in the military but in many other training and educational settings.

Seven problem areas will be discussed in this section. Certainly others could be identified, but these seven seem to the authors to be especially important. In some of the seven cases the authors suggest possible alternative solutions. In others, the authors confine themselves merely to problem identification. In these cases, the discussion of alternative solutions would either be too detailed for the scope of this chapter or no viable alternatives could be identified at present.

The problems are discussed and ordered within the framework of the IPISD model whose phases, once again, are Analyze, Design, Develop, Implement, and Control. While some of the problems may be related to more than one of the five phases, the decision was made to concentrate each problem on that phase to which it is most relevant. This was done to make the sequencing of the problems more logical.

Phase I - Analyze

Problem 1: Failure to Integrate the DOD Budgetary Process With the Training Analysis and Design Process

The influence of the DOD budgetary process has a great impact upon the educational technology efforts of the military. This fiscal planning must often start seven years before the innovation is actually introduced to the trainees. From a distance it may appear that this detailed planning is of great help to those concerned. However, for those professionals intimately involved with the process it can be highly counterproductive. One very critical problem towards which this process contributes is the tendency to focus the military's sights upon hardware procurement to the detriment of training. Enormous amounts of effort are expended in defining and procuring the expensive operational equipment (planes, ships, tanks, etc.). Training needs are often no more than an afterthought, and instructional development frequently does not proceed along with hardware development (Scanland, 1978).

The lack of integration of hardware with training, which is in large measure due to the long budgetary process, is illustrated in the following quote from the Office of the Chief of Naval Operations:

> "Although the weapon system acquisition process has been subject to extensive specifications and control, the identification and evaluation of manpower, personnel and training resources associated with a proposed system design traditionally has not occurred until late in the hardware systems development. In theory at least, hardware design was responsive to mission requirements and necessarily of primary importance; supportive considerations, therefore, were given little attention until program decisions concerning weapon design and development

> were made. The result has been the increasing difficulty experienced by the Navy in supplying sufficient numbers of qualified, trained personnel to meet operational needs." (CNO (OP-112C), Hardman Methodology Handbook, 1 Nov 1980).

A second aspect of the budgetary problem is associated with the actual cycle of the DOD fiscal year. Funding for training is allocated to large training agencies, which in turn divide it among various DOD working groups or external contractors. The DOD working group (e.g., educational specialists, psychologists, and engineers) must build a schedule around the fiscal year. Money not committed prior to the end of the year often reverts to the sponsor; there is thus a great pressure to compress schedules in order to obligate the funds. These procedures often leave little time for the analysis necessary to assure quality training. The emphasis is too often placed upon the demands of the comptroller's offices rather than upon the demands of the training systems.

Problem 2: Failure to Fully Analyze the Task and the Learning Environment

Although task analysis has been recognized as a key step in military training design (Branson, 1975), its implementation is frequently incomplete or shallow. The distinction between a task listing which simply names activities, and a detailed task analysis which includes information on how a task is performed and to what standard, is often not fully understood. Despite an increased effort in the task-analysis area in the last few years, there still remain many military courses which are not based upon a firm analysis of the tasks which the trainee must accomplish. Often, they are rather a reflection of the personal experiences of the instructors, which vary greatly from one to another. Linked with the problem of an abbreviated task analysis is the frequent failure to fully analyze the training situation so that a training strategy can first aim at the right performance criteria, and secondly can take into consideration the facilities, media resources, equipment, and human resources required to meet those criteria.

The identification and resolution of these problems is currently progressing, but they will continue to plague development efforts for some time to come. The demand for quality training analyses frequently outstrips the resources available within DOD for accomplishing these analyses. A complete task analysis is highly manpower--intensive work, much of which must be performed in the field. Task analyses lasting 1 - 2 years for a complex course are not uncommon. Formal school personnel are often too busy with day-to-day tasks to be able to devote full time to analysis efforts. The Instructional Program Development Centers of the Navy have a huge backlog of work that will not allow them to address all of these task analyses. Contracted efforts can be very expensive (analysis efforts of $500,000 plus are becoming more frequent). This large level of effort often surprises the uninitiated, and unfortunately management decisions at all levels of training are still being made which fail to take these factors into account. The necessary resources and time are seldom programmed for quality analyses, and consequently the eventual training systems have inherent weaknesses.

PHASE II - DESIGN

Problem 3: Substitution of Trivial Objectives For More Meaningful, But Difficult-to-Measure, Objectives

The need for "objectives" as a focusing point for instructional development is well understood and widely practiced (Kapfer, 1977). It is such an article of faith, however, that subtle problems are often overlooked when dealing with objectives.

It is usually argued that objectives should be derived from an analysis of a task or function. However, is must be realized that instructional objectives are specified based upon a value orientation, but with no direct relationship to an observable task. An example might be the general insistence that students learn basic algebra before going on to fundamentals of radio repair. The first reaction on the part of military developers to this method of arrivng at objectives was to eliminate it completely, in favor of a strict linkage to a narrowly-defined job (e.g., Dougherty & O'Neill, 1978). The call for the elimination of "nice-to-know" objectives which do not bear directly upon the job task has been heard frequently in military training circles. This reaction has created problems when it has been applied in some cases. The result of this policy may have led to the abandonment of many significant but hard-to-measure objectives in some military training in favor of trivial but more-easily-measured objectives.

It is widely held within the military that instruction must be purged of anything not directly linked to a specific job. However, jobs in this regard may be conceived in a very narrow sense. The goal of training becomes limited to meeting the requirements of the narrow job. While it is definitely necessary that these job tasks be well learned, this proclivity for instruction which is extremely job-specific may limit the development of the trainee beyond the narrowly-defined job. Instructional algorithms are created which feature the trainees as integral parts of the training system, but the trainees are often not able to expand their skills beyond that system because they have become used to trivial, easily-achieved objectives.

This policy of limited-skills training may work reasonably well when conditions for defense training are optimal (i.e., there is adequate time to train each trainee for a well-defined job, and remedial help can be given where it is needed).

However, trouble may become apparent during times of stress, when the training environment is not ideal (manpower shortages, rapid increases in high technology, many team-work requirements, etc.). In such cases, students may have to increase the volume of complex tasks they learn, and learn them at a much faster pace, in order to cover manpower shortages. Team-work requirements put an increased burden on the students to become cognizant of more than just their assigned job-tasks. They must become involved in complex interactions with other machines and people. When these less-than-optimal training situations arise, students and instructors who are used to dealing with trivial, easy-to-measure objectives may have difficulty in making the transition to more complex, but difficult-to-measure objectives.

Despite some success in the past years in the area of instructional objectives development, military developers have no reason to be complacent. In fact, they should rigorously examime the use of objectives in building training programs. It must be remembered that quality objectives are more than just a matter of good format. The goal of an instructional objective is to ensure coherent, fully functioning performance when the trainee moves to the total job environment. That job environment may require the trainees to rapidly expand their skills beyond the boundaries set in training schools. The constant use of trivial objectives in the training environment may make this expansion difficult.

Phase III - Develop

Problem 4: Failure to Consider the Need For Effective Motivation in Some Training Programs

The problem of a lack of consideration for proper motivation in military training is by no means universal. It occurs often enough, however, (Naval Technical Training Command, 1977), to warrant inclusion in this discussion of educational technology problems.

Current instructional programs often tend to reflect a variety of needs: budgetary, administrative, engineering, and those of the instructional developers. Unfortunately, learner needs are not reflected as often as they should be. The wide variety of trainees entering the armed forces requires an array of varying motivational techniques for training (individualized instruction, peer recognition, rewards such as increased free time, more rapid promotion, etc.).

Quality instructor-student relationships, self-accomplishment, peer-group cooperation, and command support are just some of the important components of an effective motivational approach. Yet these factors may be poorly managed by instructional developers working for the military when they concentrate upon developing effort does not consider all of the unique features in each individual training situation which might have an impact upon motivational strategies. The result may be instruction which is devoid of rewards that are linked to active student learning.

Renewed emphasis upon the training of all military school personnel in the IPISD methods could alleviate much of this motivation problem. Since these instructors are "on the scene" there is a good chance that instructional materials developed by them would foster increased motivation in their students.

Problem 5: Failure to Provide a Detailed Strategy of Instruction

When a systems design model, like the IPISD model, is used for instructional development, a fairly well-defined groups of steps is prescribed. Some of the more common steps are: Task Analysis, Selection of Tasks to be Trained, Writing of Objectives with Standards and Conditions, Media Selection and Prototype System Development. In addition, the rational selection of a detailed Strategy of Instruction is called for in virtually every model of instructional design (Andrews and Goodson, 1980). Unfortunately, often in military training development, the selection of a strategy of instruction consists of nothing more than a gross designation of a delivery method ("lecture," "slide tape," "film," "video tape," etc.). Instructional strategy formation if often neglected because undue emphasis is placed upon the many media selection models which have been developed, both by contractors and by the government. The task of selecting media should follow the procedure of instructional strategy formulation, not precede it or substitute for it.

An instructional strategy, at the very least, must stipulate learning events, along with the sequence in which they will be addressed during instruction (Gagne and Briggs, 1979). It additionally would be helpful to include message design features and provisions for learner reinforcement in the strategy. A media selection strategy only makes sense in terms of an overall instructional strategy. The failure to fully realize the distinction may account for the inadequacy of many media selection models to ultimately be of substantive assistance in the production of quality training programs. Some media selection models are actually so circular that they seem to require a preliminary media choice ahead of time in order to make them work. Others are simply elaborate and very esoteric justifications for prior decisions.

This confusion will most likely persist in military instructional development for some time to come because many government "Requests for Proposals" as well as "Military Standards and Specifications" incorrectly emphasize media selection over instructional strategy formulation. This is an example in which the original weaknesses of development efforts have become fixed by the weight of continued practice and bureaucratic inertia.

Phase IV - Control

Problem 6: Failure to Identify and Resolve Evaluation Problems

Instructional developers frequently experience discomfort under the scrutiny of evaluation. The evaluation technology field has grown tremendously over the last few years, but the natural resistance to it by developers often seems to persist. Problems of insufficient data, inappropriate data, or untimely data have combined with general confusion over evaluation and test construction methodology to reduce evaluation utility in military applications of instruction. Failure to use the findings of evaluation studies in all training fields has been referred to as almost reaching the proportions of a national scandal (Guba & Lincoln, 1981).

The use of evaluation data in military training has in some cases gone beyond the mere improvement of instructional techniques and materials. Many contractors must now show performance improvements, based upon evaluation data, before they can be paid. In the military, this type of evaluation is known as "effectiveness testing" (Neal, 1978). In principle, effectiveness testing is the logical partner of performance contracting (Lessinger, 1970) which had a run of popularity some years ago in formal education. Practical procedures and models for effectiveness testing are still evolving (Finley & Strasel, 1981).

Since military training is more directly related to actual job performance than is most of formal education, its evaluation goals are usually geared more towards showing proficiency in a real-world setting. These real-world goals can lead to special evaluation problems and errors. Three of these errors are discussed below.

The first source of evaluation error is related to the quality of the needs-assessment effort that went into the specification of the performance requirements for the new training system. When the training program is designed around ill-defined needs, or needs which do not come from real-world problems, the program will most likely be difficult to properly evaluate. It is one thing in an evaluation to demonstrate the effectiveness of a training program in achieving objectives which were selected because the program happens to teach those particular objectives well. It is quite another thing to demonstrate the effectiveness of a training program in achieving objectives that relate to a real-world military need (Kaufman & English, 1979). Many military training programs produce impressive evaluation results, but since those programs were based upon poor needs assessments, the program is of no real use to the military.

Selection of an appropriate intermediate performance criterion is the second source of possible evaluation error. Most military training systems are aimed at providing training which will transfer to combat skills, and which must be usable under stress. A truly effective training program will prepare individuals for these conditions. In many cases this ultimate combat criterion can only be approximated, and so some intermediate criterion is selected as the standard which gauges effectiveness. When the intermediate criterion which is selected for evaluation does not approximate the necessary real-world behavior, the evaluation may not have a proper goal.

For example, in training a soldier to use an anti-tank weapon, the intermediate criterion of achievement might be the hitting of a simulated target with the weapon's rocket. This criterion may not, however, be the most appropriate indicator of training success. The trainee may use the wrong procedures and still hit the target in an unrealistic testing situation. When these incorrect procedures are applied in a real combat setting, the trainee may perform poorly and consequently not hit the target. An error in the selection of the intermediate criterion or evaluation could eventually have disastrous consequences.

A third source of evaluation error is related to the populations used for the evaluation. Occasionally, nonrepresentative popoulations, or populations exposed to prior learning, are used to demonstrate the effectiveness of a training system. There is great pressure on contractors to have the trainees "pass" the effectiveness test. Consequently, these contractors may frequently want to use the same military personnel who used the prototype training materials during system development to demonstrate system effectiveness. They may also want to use their own personnel to demonstrate the system. The evaluation of the new system with these populations does not, of course, ensure that the system will be effective with the target population. It is not just contractors who contribute to this problem. Often the government cannot provide the test-subject personnel required for strong inference-type testing. In order to avoid the use of these invalid test populations, the government workers who monitor contracts must exercise stringent control at all phases. Time and resource pressures often combine to make this strict control difficult, but it must be the rule if effective evaluation is to take place.

All of these problems and sources of evaluation error can still be observed in many current instructional development efforts within DOD. Failure to eliminate these evaluation errors will probably be a problem for some time to come.

Problem 7: Failure to Make Full Use of the Iterative Nature of the IPISD Process

One of the characteristics of the systems approach is the identification of performance requirements which define the product or products to be created. A great deal of learning theory, management technique, and instructional design expertise are invoked and utilized in progressing throught the steps of the IPISD model. However, in spite of the best attempts to meet these performance requirements, often there is a large gap between student achievement on the prototype material and the requirements which were set up as performance criteria for the training system. The iterative provision inherent in all systems designs (recursive mathematical models, artillery bracketing, etc.) could correct this situation since it provides the requirement to keep revising until the criterion performance is realized.

The problem is, however, that even though most system models emphasize this revision characteristic, the process is sometimes not used in practice. The pressures of designing to cost and contracting to schedule often cause the acceptance of a less-than-adequate product because the revision process has not been implemented. Often too, the process of development is such a trial for the untrained and unskilled, who are frequently forced into development roles, that they recoil from the thought of going through the loop again. Their desire is to terminate the project as quickly as possible.

Another contributing factor to this problem is that performance requirement criteria are often poorly specified to start with. Consequently, it becomes easier to adjust the performance requirements to the results initially obtained, no matter how unsatisfactory they may be, rather than to keep working for better results via the iterative process.

Then to the extent that these conditions tend to characterize many development efforts, there is little likelihood that the iterative nature of the development process will be exercised. The resulting unsatisfactory training programs may cause people to blame the systems approach itself, rather than the method by which it was applied to the development effort.

Problem Summary and Conclusions

This section has highlighted seven problems in current applications of educational technology to military training. There are certainly others, but these seemed to the authors to be of key importance. Briefly, they are:

- Failure to integrate the DOD budgetary process with the training analysis and design process
- Failure to fully analyze the task and the learning environment
- Substitution of trivial objectives for more meaningful, but difficult-to-measure, objectives.
- Failure to consider the need for effective motivation in some training programs
- Failure to provide a detailed strategy of instruction
- Failure to identify and resolve evaluation problems
- Failure to make full use of the iterative nature of the IPISD process

The striking fact about all of these problems is that solutions to them can generally be found within the IPISD model. The model addresses, either directly or indirectly, each of these issues. They continue to be problems mainly because various constraints (e.g., political, monetary) and attitudes prevent the proper application of the IPISD principles. The authors are not suggesting that the IPISD model is a complete panacea for all training problems. Branson (1978), for example, has pointed out that the IPISD model was not intended to serve all military training needs. Rather, it was basically intended to focus upon the technical training needs of enlisted personnel. Instead, the authors are suggesting that the guidelines for instructional analysis and development which the model establishes can lead, when properly applied, to the elimination of many training roadblocks. Until the entire military training community recognizes these difficulties and systematically works on their resolution they will remain in the problem category, instead of the accomplishment category. The next section will briefly describe some trends which may help to operationalize possible solutions to these problems.

TRENDS FOR THE FUTURE

When we couple the history of educational technology in the Department of Defense with the rapid advances being made both within and without the DOD, it is difficult to list all of the possible trends. However, a few seem to be of special significance and will be discussed in this section.

First, there will be an expansion of the use of computers in various educational and training applications. The use of computers in training has proven extremely useful and seems to have advanced well beyond the educational "fad" stage. There have been some disappointments with this technology (Orlansky and String, 1980). These have, however, been relatively few when compared to the total breadth of computer application.

Much of the recent interest in the use of computers for training is due to the development of the micro computer. Micros allow training control at the school level. This control facilitates the development of self-contained training programs to deliver a great variety of interactive instruction. Larger mainframe computers will be increasingly linked with several training commands over great distances (Micheli, et al., 1980; Summer, 1979; Fletcher, 1975). This will allow greater cost-effectiveness as more students are able to use the same courseware. Computers of all sizes will be relied upon more and more for both instructional delivery and instructional management (Dougherty and O'Neill, 1978).

Experiments with "artificial intelligence" and "reactive learning environments" have been conducted for the Air Force and they have resulted in such computer-based teaching systems as "SOPHIE" (Sophisticated Instructional Environment) (Brown et al., 1974). This system approximates the use of a tutor to interact with the student. It features a natural language processor to facilitate limited man-machine dialogue and bases computer responses upon interactive simulations of the learning content rather than upon strict preprogrammed or fixed responses to set inquiries. Another current effort is represented by "NEOMYCIN" (Clancy and Letsinger, 1981). The use of such systems is likely to increase as the technological problems are gradually solved. Instructional developers will surely be involved with defining content and extending the use of such systems (Brown et al., 1974; Gunwaldsen, 1975).

Computer models are now being devised to assist in the use of evaluating new innovations in educational technology (Duffy et al., 1977). This area of development will also be typical of the many computer tools which will be available to the military-oriented instructional developer. These developments, of course, are not the last word. Research will continue; and Hickey (1974) has proposed research guidelines to further efforts related to computer-assisted instruction.

There will also continue to be accompanying problems associated with an over-emphasis of computer hardware versus courseware development. This emphasis often causes gross underestimations as to the time, effort and money required to supply computer-oriented training with the essential courseware needed for valid instruction. However, even this problem will not reverse the trend toward greater expansion of computer usage.

A second trend will be the increased emphasis that will be placed upon determining the cost effectiveness of training systems being developed within DOD. The need for this evaluation has been recognized since the days of the McNamara Defense Department in the mid 1960's. However, in practice the analysis of costs and benefits has remained at a very gross level. As training continues to take a smaller percentage of the total DOD resource outlay, it will become even more important that the cost-benefit of each dollar spent for training be carefully accounted for. Efforts are now being made to refine these methods to fit specific applications in training development (Donahue, 1980; Neal, 1978; Orlansky and String, 1977).

A third trend is also due in part to the resource problems which military training concerns are presently encountering. The tremendous need for analysis, design, and development of training systems for the military will far exceed the government's ability to provide this service through in-house resources (Ansbro, 1978). In the immediate future there will be a trend toward the expanded use of contractor help to design and produce training systems for use by the armed forces. This will take place even where the use of contractor personnel is extremely costly. The government's own instructional development personnel will be increasingly utilized in the needs assessment, initial problem definition, front-end analysis, and contract management roles, while the follow-on development work will be mainly accomplished by contractors.

A final trend, which is becoming more pervasive throughout the entire field of educational technology, is the attention being given to cognitive psychology (Lowe, 1980). The early influence of behavioral psychology upon the field of educational technology was quite pronounced. The military training community was no different in its acceptance and use of behavioral principles. However, now, as the importance of cognitive factors (motivation, attention, information processing strategies, etc.) is gaining more emphasis, the military training community is starting to examine the benefits which can be derived from combining both behavioral and cognitive psychology. A better "mix" of training concepts, utilizing principles from each psychological area, is the result and further work is bound to continue (Miller, 1980).

CONCLUSIONS

It is difficult to reach definitive conclusions with regard to the use of educational technology within the military. Certainly, this chapter has not captured the entire military training situation. Considering the great training challenge, we can say that few opportunities exist with a greater potential for proving the merit of educational technology. If the problems facing the field can be overcome, the state-of-the-art of military instructional development will indeed be representative of the promise inherent in the educational technology enterprise.

Several conclusions regarding the state of DOD training can be emphasized. First, the effort to use untrained and unskilled personnel in the development role to implement the various instructional development models has not been very successful. The most progress in this area seems to have been made where pockets of well-trained professionals have existed (Ansbro, 1978). More help must be directed at the point of instruction, the formal military schools. The instructional development models cannot carry the load without people who can translate the logic of the model into practice.

A second conclusion centers around the need for broader and more rigorous training of instructional systems developers who wish to fill a military role. Few educational institutions offer a curriculum which fully prepares instructional developers for the tasks which they will perform when working in nonacademic settings. The public school teacher-oriented curriculum only partially fills the need. In addition to instructional development courses, computer science, business, research, and evaluation courses must be more fully utilized in the training of prospective military instructional developers.

A final conclusion concerns the importance of a national commitment to quality military training. The issue of how strong the U.S. defense services should be, when compared to those of other countries, has been a much-discussed topic in the last few years. This debate has been precipitated by intelligence reports which indicate that the U.S. defense now has fewer people and fewer traditional weapons (planes, ships, tanks, etc.) than its most like foe. The U.S. response has been an increasing reliance upon high technology to fill the gap. A large portion of the defense responsibilities now resides in very sophisticated defense systems.

This same reliance upon high technology has been transferred to military training in order to fill the training gap created by such factors as fewer instructors, more complex courses, and trainees with fewer academic skills. As this chapter has attempted to point out, the results of this technology application have been mixed. Educational technology, when narrowly defined as merely sophisticated delivery systems (computers, television, etc.), will not fill this training gap. Even when the broader definition for educational technology used in this chapter (planning, research, evaluation, etc.), is accepted and its principles used, the gap between training delivered and training needed may not be filled entirely.

In addition to aid from educational technology in solving training problems, there should be a recognition at political levels, where money for defense is allocated, that more resources for training are required. The sophisticated weapons systems will be of little use if the humans who operate and maintain them lack the necessary skills. Such training considerations as longer periods for training, more instructors, and more incentives for retention of skilled training personnel are very likely required if defense readiness is to be attained. Educational technology alone cannot solve the military's training problems. In addition, national resolve for quality military training must be understood and acted upon at the political level if the armed services are to meet their security commitment.

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Chapter 38

Instructional System Development in the United Stated Air Force

Hilton D. Goldman

The ID model has probably received its greatest development in both richness of detail and breadth of application within the military. Presented here is a detailed description of the model as it has been developed by the U.S. Air Force. Also presented is a history of this effect, its successes and its problems. Much information and many techniques which can be exported intact to other settings are included.

THE EVOLUTION OF AIR FORCE TRAINING CONCEPTS

By directive, the Air Force is committed to using an instructional system development (ISD) process for developing new instruction and for revising existing instruction. The implementation of the ISD process represented another step in an evolutionary process that began in the Fall of 1943 (when the Air Force was still part of the Army). Till then, instruction had been accomplished largely through the use of lectures and demonstrations. Then Lieutenant General Walter R. Weaver, Commander of the Technical Training Command, ordered all chairs removed from the classrooms, prohibited the use of classroom lectures, and banned the use of written examinations. General Weaver believed in practical training. The students were to learn by doing. The instructor provided demonstrations to precede the student performance, and gave over-the-shoulder guidance as the students performed. In the earlier stages of their training, the students worked with part-task trainers, cut-aways, and models. By the final stage, they were working with actual equipment in real or simulated job conditions.

In 1950, the Air Force Training Command adopted the use of the term "developmental approach" to instruction, and made its practice a command-wide policy. "Developmental approach" referred to student-centered instruction in which the student learned through controlled self-activity. This approach started with that which the student already knew at his ability level and lead through successive steps of reason and progress to the desired result. The developmental approach was essentially problem-oriented; the problems, which the student was encouraged to solve, were posed through the learning activities. The problems were centered around experiences which would give the student the opportunity to use mental and motor abilities and to develop the skills necessary to do the job for which he was being prepared.

The next step in the evolution of Air Force instruction came in September 1961 when Headquarters USAF directed the implementation of programmed learning. An ordery transition was to occur in a series of phases leading from research through development to operational application. Programmed learning was defined as "efficient learning which results from employing programmed instructional techniques and materials to help students meet specific learning objectives." It was "a complete system" that included all instructional materials, equipment, and educational media, designed and validated to attain instructional objectives. The following concepts are basic to programmed learning as conceived by the Air Force:

Behaviorally analyzed. The task to be learned is subjected to a detailed analysis, and training objectives are explicitly specified.

Controlled student responding. By forcing the student to make specific overt responses, her/his behavior is shaped step by step until s/he achieves a mastery of the subject.

Immediate confirmation. Following her/his responses, the student is provided with knowledge of results. Making a correct response, and being confirmed in her/his response, strengthens the probability that s/he will respond appropriately in a similar situation later.

Optimum Step Size. Instructional material is broken into "small" segments to which the student can respond correctly. They should not be so small as to be boring, nor so large as to be confusing.

Controlled pacing. Normally it is not necessary for all students to move at the same pace, but they must arrive at the same place.

Validation. Instruction should be tested to see if it successfully teaches representatives of the target population before it is released for use in operational courses.

Student-Centered. All of the previous characteristics point to the student. What does the student need to know? Get the student actively involved, not just the instructor. Let the student know how well s/he is progressing all along the way. Present material in portions commensurate with her/his learning ability. Within reason, let her/him learn at a rate appropriate to her/his ability.

The Air Training Command conducted a 1½ year investigation to determine the feasibility of an extensive application of this educational technique. During this period, about 350 people were trained to develop programmed instructional materials (doubling the number of trained instructional programmers in the United States). They produced approximately 100 experimental programmed-instructional packages to replace conventionally-taught topics that had each taken from two to thirty hours to teach. These packages involved a wide range of subject-matter and applications. When the experimental packages were field tested, the results were encouraging: though the developers were working with limited resources and experiences, these packages produced an averaged reduction of 35% in training time and an average gain of 15% in achievement.

One of the things that was learned from this experience was that independent study need not be reserved for just the superior students. Another is that the self-pacing of a short segment of a longer course does not result in a time savings, unless that segment is at the end of the course. The other benefits from programmed instruction also are much greater if the complete course is programmed than they are if only one segment of the course is programmed, or if each segment is programmed independently.

By now, thinking was in terms of instructional system. The Air Force approach to instructional systems development was hammered out at a workshop held 1-5 June, 1964. What emerged represented the consensus of the thinking of many people, including Robert Corrigan, Bill Deterline, Roger Kaufman, David Klaus, Robert Mager, Sylvia Mayer, Sue Markle, Col. Gabriel Ofiesh, Maj. Marvin Roever, and Leonard Silvern. They were leaders in programmed instruction and human engineering,[1] and they drew heavily from both fields to produce their theoretical model for instructional systems development. The ISD process delineated by the 1964 workshop has since been polished and refined, but basically it is still the same.

The workshop members also drew up a plan for implementing this model. They chose to create a number of instructional systems development teams, manned primarily by instructional programmers. The teams would be the means for developing the instructional systems.

The first major instructional system developed by one of these teams was the Administrative Specialist Course. That system became operational in August, 1965. Before systemization, this was a 330-hour course for the training of apprentice-level Air Force clerk-typists. The students were taught typing (at least 35 words per minute), Air Force publication, correspondence procedures, and filing. The systemization process showed that self-paced instruction was better suited to this course than the group-paced instruction that had been used. Following systemization, the average student needed less than 210 hours to complete the course, and some students finished in as few as 96 hours. Based upon extensive field testing which was conducted prior to its acceptance, at least 90% of the graduates of the instructional system were able to successfully perform at least 90% of the training objectives. To fully appreciate this accomplishment, you should know that the conventional version of the course was highly effective on its own right, and was steeped in tradition. This made it even more difficult to introduce changes that involved a break with that tradition.

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[1] Human engineering means the engineering of equipment for human use. It is concerned with assigning to each - to man and to machine - the function each performs best, but always considering that man and machine must operate as an integrated unit. "Good" human engineering means that the designer has made optimal use of both. The human engineering design problem is not how to design a machine, but how to design a system.

Table 38-1. Evolution of Air Force Approach to Instruction.

Characteristics	Learn by Doing	Developmental Approach to Training	Programmed Learning	Instructional System Development
Student-centered Instruction	X	X	X	X
Training experiences determined by job requirements	X	X	X	X
"Job requirements" determined by expert opinion	X	X	X	
Job requirements determined by survey of operating activities				X
Training defined by objectives		X	X	X
Objectives stated in behavioral terms			X	X
Common understanding of objectives by students and instructors		X	X	X
Objective measurement		X	X	X
Provision for quality control		X	X	X
Start training where the student is		X	X	X
Validate instructional materials			X	X

The evolution in the Air Force approach to instruction is summarized in Table 38-1.

THE AIR FORCE INSTRUCTIONAL SYSTEMS DEVELOPMENT PROCESS: INTRODUCTION

Instructional systems development (ISD) is a deliberate and orderly process for planning and developing instructional programs in order to insure that personnel are taught the knowledge, skills, and attitudes essential for performing a job successfully. We emphasize that ISD is a **process.** The instructional system which is developed as a result of applying that process is the product.

These are some of the concepts that underlie the USAF ISD process:

-- The instruction to be provided is determined by the skills, knowledge, and attitudes that are needed to do the job. Air Force instruction must equip people to do their jobs. More instruction than that is wasteful; less can cause big problems. So, the designer must know what the job requires.

-- Instruction is provided only for those job requirements which the students have not already mastered. It is inefficient to "teach" them what they already know or can do. So the designer must know what relevant knowledge and abilities the students entering training bring with them.

-- The instruction the students need must be identified in specific terms which will communicate the same meaning to all who are involved in that instruction: the curriculum planner, the instructor, the student, and the job supervisor who will receive the graduating student. To assure such communication, the Air Force requires that instructional objectives be stated in terms of observable behaviors. (More precisely: the behavior, the conditions under which it is to be performed, and the standards for performance.)

-- Students are tested on their ability to meet the criteria defined by the objectives, rather than on how well they do as compared to other students. This is a logical consequence of the policy that the only reason for training in the Air Force is to equip people to do their jobs.

-- The instruction is **student**-centered. Objectives are stated in terms of student performance, rather than in terms of what the instructor will do. Instruction also is described in terms of student activity.

-- Both the students and the instructor know what must be learned, and when the students have learned it. They know what must be learned because they are all privy to the objectives. Test items are devised to measure the attainment of each objective, and these items must test for the same behaviors that are spelled out in the objectives. So there are no surprises, no "tricky" tests.

-- If the student doesn't learn, it is the fault of the system design - rather than of the students - and the system must be reworked until it is effective.

-- Instruction must be provided in the most cost-effective way possible. That is, we seek to provide **quality training at the right time at the least cost.**

THE AIR FORCE INSTRUCTIONAL DEVELOPMENT PROCESS: THE MODEL FOR ISD

In the briefest terms, the Air Force ISD process requires the following actions:

1. Determine precisely what the skilled performer does when doing the job, how well s/he must do it, and under what conditions.
2. Determine if instruction (in this chapter, **instruction** can be read **both as education and as training**) is needed and, if so, determine what instruction to give the untrained personnel so that they can do their jobs well.
3. Express these instructional needs as specific behavioral objectives. Devise a test item for each objective so that you can know if and when the students achieve the objectives.
4. Design instructional procedures and materials to help the students achieve the objectives. Validate these procedures and materials by having students try them to be sure they are effective. The measure of success is their ability to accomplish the test items. If the students fail the test items, redesign the instruction until it works.
5. Conduct and evaluate the instruction; and later, evaluate the graduates on their ability to do their jobs.

A simplified five-step model summarizes the process and shows the inter-relationships involved.

1. Symbolically, Figure 38-1 shows that each succeeding step of the model builds upon information which was developed in the preceding step(s). However, this does not mean that the developer must **complete** each step before starting on the next. Realistically, s/he could be involved with actions in several steps simultaneously.
2. The feedback and interaction arrows symbolize the fact that changes in one part of the model can affect other parts of the model. An example would be the evaluation of the graduates. Evaluation of their ability to do the job (step 5) might show that they cannot properly perform part of the job. This might be a result of improperly designed instruction - or it might be that the job has changed since the instruction was implemented. In the first case, the developer may need to change the instruction (step 4). In the later case, s/he may need to return to step 1 and make a partial or even a complete re-analysis of the job requirements.
3. The outer box around the model is labeled "constraints." It symbolizes the real limitations that the instructional programmer must deal with: the preferred training medium may cost too much; there may not be enough time to do a thorough analysis of systems requirements; there may be no opportunity to try out (validate) the

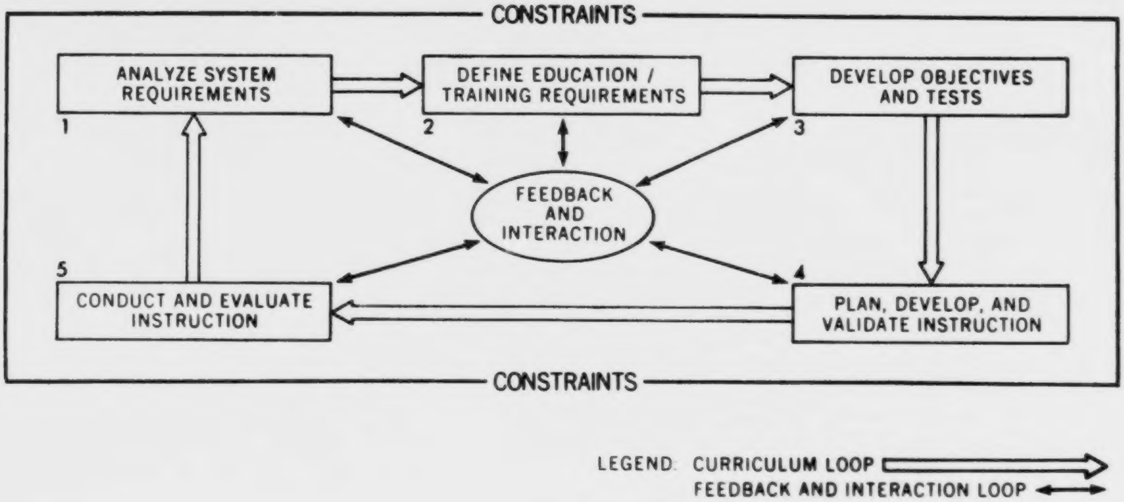
CONSTRAINTS
ANALYZE SYSTEM REQUIREMENTS
1
DEFINE EDUCATION / TRAINING REQUIREMENTS
2
DEVELOP OBJECTIVES AND TESTS
3
FEEDBACK AND INTERACTION
5
CONDUCT AND EVALUATE INSTRUCTION
4
PLAN, DEVELOP, AND VALIDATE INSTRUCTION
CONSTRAINTS
LEGEND: CURRICULUM LOOP
FEEDBACK AND INTERACTION LOOP

Figure 38-1. Model for instructional system development.

instructional materials before they are used, and so on. These constraints must be considered in the design of the system. The goal of the instructional system designer is to build an instructional system which is the best possible one considering all of the alternatives, where "best" is defined to be the most cost-effective way possible. The need to deal with valid constraints is not license to bypass major parts of the systems-development process for frivolous reasons. compromises, and the reason(s) for them, **must be documented decisions.** This is necessary because ISD is an iterative process, and it may be desirable to make changes in the implemented system once a constraint has been removed. Unless there is documentation, it is quite possible that the reason things are as they are may be forgotten.

4. The significance of the fact that the steps of the model form a loop is that the developer can enter the model at any step in the process. Thus, for ongoing instruction, s/he might start the process as a result of a graduate evaluation (step 5) which indicated some problems with the instruction. A change in training policy would cause her/him to enter the process at step 2. A change in job performance requirements would require entering the process at step 1.

Documentation is an important part of the systems development process. Though the Air Force publications on ISD show formats to be used for the documentation of the process, these are suggested rather than directed. The basic ISD process is applicable to the whole spectrum of Air Force instruction, from heavily performance-oriented technical training to heavily cognitively-oriented college-type education. Therefore the specific documentation needs will vary. So the Air Force allows for flexibility in the amount of documentation to be provided and in the way it is to be formatted. Documentation is a means to an end - not an end in itself. Every bit of documentation put together during the development of the system should serve a useful purpose. The system designer should document in whatever way is most useful to her/him. How much documentation is enough? Obviously, a course that is to instruct many students, or one in which the cost of instruction is high, should be given more careful development and documentation than a course designed to teach just a few students a relatively noncritical subject. In any case, s/he should document in enough detail to provide a "data trail" so that others may know the basis upon which the major decisions in the design of the system were made. Unless such a data trail exists, it is impossible to profit from past mistakes, or to refine the system when recycling through the model sometime in the future. More specifically, the data trail should provide answers to the following questions:

1. What was the basis for deciding that instruction was needed?
2. What basic assumptions or major constraints applied? (Possible examples: "Train for assignment only;" "There was a maximum of one month to develop instruction;" "Because of fuel limitations, there could be only four training flights per student;" etc.)
3. What was the basis for deciding what tasks required instruction?
4. What was the basis for deciding what type of instruction to use (i.e., formal course, OJT, correspondence course, performance aid, etc.)?
5. What was the basis for the major instructional-methods decision(s)?

6. What was the basis for the major instructional-media decision(s)?

7. What was the basis for the instructional sequence that was selected?

As a minimum, the following documents should be included:

1. An ISD application plan to ensure management control of ISD actions.
2. A listing of essential job tasks.
3. A training standard[2] (if appropriate).
4. A list of objectives.
5. Test items to measure the objectives.
6. A Plan of Instruction/Syllabus/Course Outline (if appropriate).
7. A course chart (if appropriate).
8. The validation data for the instructional materials.
9. The feedback data from evaluation.

How long should these data be kept? Keep it as long as it is needed for reference. Generally, this would mean that the developer would keep it as long as the instructional system was operational. Of course, portions of the data might be replaced as they are superseded.

The ISD process is begun when someone identifies a need. A few examples:

-- "Supervisors of recent graduates of course ______________ complain that the graduates are ineffective in locating electrical troubles in the ______________ system."

-- "Next year we'll be getting a new test stand, and our maintenance men don't know how to use it."

-- "The shop should be able to overhaul four engines a day, but they have been averaging only three."

-- "During the past six months our personal injury rate has been going up."

-- "They just don't have the right attitude!"

After determining what the job involves (Step 1), the developer must decide if the need can be corrected by instruction. If it cannot, there is no need to proceed further with the ISD process. If instruction is needed, s/he must determine what instruction to provide (Step 2). Before s/he chooses instruction through a formal course as the way to meet the need, s/he should consider other, less costly, alternatives (such as assigning or reassigning qualified personnel, the use of performance aids, on-the-job training, etc.). If s/he determines that a formal course is appropriate, there still are several options: to use an existing course, to modify an existing course, or to develop a new course.

When the developer begins to apply the ISD process, **s/he should not set out to "ISD a course" or courses.** If there is a valid need for one or more courses, the need will be revealed as s/he proceeds through Steps 1 and 2 of the process. If s/he prejudges the need for a course before s/he has the data upon which to base that decision, s/he may devise an unneeded course. Management often makes this mistake, deciding that the establishment of a course is a cost-effective solution to a problem, and directing the establishment of that course, before it has been determined that there is a valid instructional problem. Often, they will compound the problem by setting the course-length. Thus, "We need a one-week course in shop safety because the accident rate in our machine shops has tripled in the last six months." What they should say is "The accident rate in our machine shops has tripled in the past six months. Make an analysis to determine what must be done to correct this situation. If training is a part of the solution, prepare an ISD plan for my review and approval."

Description of the Process: Analyze Systems Requirements (Step 1)

The first step in the ISD process is to analyze the requirements of the operational system. This analysis is critical because all other steps in the ISD model depend upon information provided by this analysis. The system will involve people to support it, to operate it, to manage it. The analysis must identify the different human roles in the system and what kinds of performance each will require. The analysis must also answer the questions, What will it take to get people qualified to do these jobs? and, Will this include a need to provide instruction?

System analysis involves the collection of data about the system and its operation. Analysis of this data should produce a description of the system in terms of:

a. Mission or purpose
b. Functions or performances required to satisfy the mission.
c. Major subsystems and components used to structure the system.
d. Equipment or materials required to support the system.
e. Established concepts, policies, or procedures for system operation, maintenance, or use.
f. Effects of environmental and psychological factors on system operation and maintenance.
g. The functional responsibilities of people.

As data about the operational system are gathered, they must be analyzed in order to identify the human tasks required to operate, maintain, control, and support the system. The product of this effort is a list of all job tasks, the equipment or materials involved with each task, the conditions under which the task must be done, and the standards of performance which must be met. These are the job performance requirements. For later use, the developer will need data on how often each task is done, what the safety requirements are, how critical the task is, and how difficult it is to learn to perform it. S/he can make determinations by observing the personnel in the work environment, by interviewing or surveying supervisors and subject-matter specialists, and by studying the applicable speciality description, training standard, related training documents, design documents, technical orders, and other documents which provide information on the system.

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[2] A training standard is a control document which specifies the skills and knowledges, and the proficiency in each, that the graduate is to possess.

There are many possible sources of data which can be tapped dealing with new equipment. The contractor is a major source of data.

For on-going programs that are to be systemized, the best source of information is the experienced person on the job. This may be the worker or the supervisor. Several methods are available for gathering this information; each has strong and weak points:

1. **Occupational survey.** The occupational survey is the Air Force procedure for the analysis of Air Force occupations which produce duty and task lists. Occupational surveys obtain, from a sample of job-holders, background information about them and data about the duties and tasks they perform. This information is put together and statistically analyzed by computer. The results are presented in the form of an Occupational Survey Report. This report includes:

-- A list of all of the tasks performed.

-- The percent of the members who perform each task.

-- The relative difficulty of learning each task.

-- The training priority (a numerical index that will show the tasks' priority for resident training).

The USAF Occupational Measurement Center is an organization that specializes in conducting these occupational surveys for the Air Force.

2. **Questionnaire.** The questionnaire is a way of gathering job information through a mail survey. It asks job-holders to give certain background information and to describe the job in their own words. When describing their job, the individuals are asked to identify the duties and tasks they perform and to list the materials, tools, and/or equipment they use. Supervisors may be asked to verify responses before the job-holders return the questionnaires.

3. **Checklist.** This survey method is different from the questionnaire method in that the checklist contains a list of duties and tasks believed to describe the specialty or a position in a specialty. The duties and tasks listed are based upon information gathered from specialty descriptions, instructional standards, job proficiency guides, and procedural or technical publications. In this type of survey, the individual is asked to identify, usually by means of a (✓), the duties and tasks s/he performs. The results of the survey are used to update the duty/task list for the specialty or position. It is possible to administer the checklist to a large group of job incumbents, thus making job-requirements data from widely representative sample populations rapidly and economically available.

4. **Individual interviews.** In using this method for collecting job-requirements data, the developer selects a number of representative workers to be interviewed. S/he asks those selected what duties and tasks they perform. Each person is interviewed, usually away from the work situation, and the information is recorded on standardized forms. When all of the interviews are completed, the information is consolidated into a single job-performance requirements list.

5. **Observation interviews.** This method is like the individual interview except that it takes place at the worksite. While the worker performs duties and tasks, the person gathering the information asks questions about the work being done and records the information. As a result, the information obtained should be more specific, more complete, and more accurate than that obtained by other methods. It is important to select for observation those personnel who are at the skill-level that the instruction is to produce. Thus, watching a highly experienced hand at work may give a wrong picture of what is to be expected of a newly graduated worker.

NOTE: The job observation will identify what the workers **do.** The questionnaire or individual interview will identify what they **say they do.** The questionnaire or interview data must be used with caution because workers tend to say they do what they think they should do.

If the developer is dealing with attitudes or with knowledge that is not task knowledge--a category that applies primarily, but not solely, to education courses and to programs for changing attitudes--s/he may have to apply **goal analysis** or **content analysis.**

1. **Goal analysis.** Knowledges and attitudes are in the mind. They cannot be seen. The problem, then, is that the techniques previously described (occupational survey, questionnaire, checklist, or interview) are usually limited to what is observable and so will not directly and reliably show the knowledge and attitudes necessary to do the job. But there is an alternative: goal analysis. All educational programs are based upon broad goals. (A goal, as the term is used here, is a statement of educational purpose). For example, job supervisors may say that the workers must "appreciate the importance of ground safety in performing their jobs." This could become a goal for an instructional program. Before the developer can use such a goal statement in the instructional design process, it must be changed into behaviors that can be seen, and that would be accepted by the supervisors as very likely indications that the

workers do have this appreciation. It is necessary to define these indicator behaviors and to use them as possible evidence that the knowledge or attitudes exist. Some behaviors that might be accepted as indicators that the workers do "appreciate the importance of ground safety in performing their jobs" are:

-- Follows published safety procedures and regulations even when not supervised.

-- Keeps work area clean.

-- Reports safety hazards.

-- Talks to others about their unsafe practices.

-- Gives suggestions for improving safety.

These indicator-behaviors could be treated as job performance requirements.

2. **Content analysis.** Some courses are intended to teach a body of knowledge (for example, astrophysics, aptitude and achievement measurement, social psychology). The goal is to "cover the subject," rather than to teach the student specific job applications, because the jobs are so many and varied. In this case, too, the occupational surveys, questionnaires, checklists, or interviews described earlier in this chapter may not provide much guidance as to what to include in the instruction. The next-best thing is to accept, as a goal, that the instruction should cover all of the subject-matter identified in the title. If this is done, the subject-matter experts will decide what the goals should be. These goals would substitute for the job performance requirements, and the developer would use these as the starting point for instructional design.

Job-performance requirements form the base upon which to design instruction and the frame of reference for evaluating the instruction. In addition, the developer uses job performance requirements to determine the number of personnel required from each Air Force specialty; the interaction between system personnel; work location; and the equipment, tools, or materials required to do the job. This information makes it possible for her/him to:

1. Determine what kind of instruction, and how much of it, is needed. Decisions about the amount and kind of instruction have implications for the amount and kind of instructional resources which will be needed (Figure 38-2).

2. Because of operation, equipment or policy changes in the time between the determination of the job performance requirements and the use of the completed instructional system, the instructional system could be outdated by the time

JOB PERFORMANCE REQUIREMENT:

Using the correct checklist, the pilot performs a walk-around inspection of the T-38 aircraft before flying it.

Task: performs a walk-around inspection.

Conditions: using the correct checklist, and a T-38 airplane....

Quality Standards: "correctly" is implied.

IMPLICATIONS FOR INSTRUCTION THAT WILL SUPPORT THIS JOB PERFORMANCE REQUIREMENT:

- The trainee will *not* have to memorize any information contained in the checklist.
- The trainee must learn to associate the nomenclature of the checklist with the components of the aircraft.
- The trainee must learn to discriminate between "correct" and "faulty" for each checklist item. The amount of drill needed will vary from item to item depending on the criticality to flight safety.

IMPLICATIONS FOR RESOURCES NEEDED TO SUPPORT THE INSTRUCTION

- The trainee should have a copy of the checklist.
- A T-38 aircraft should be available for the trainee. It may be possible to reduce the requirement for aircraft by using photographs or slides.

Figure 38-2. Job performance requirements.

it is completed. To avoid this, probable changes in the job should be included in the data gathered.

Before instructional system planning and development can start, the developer must make a thorough analysis of the system, career area, or speciality to which the system graduates will be assigned. To do this requires that s/he use all of the sources of information available to her/him. The data obtained from the various sources should be compared in order to ensure accurate identification and a good understanding of the requirements. The system analysis must also give information needed in order to decide if instruction is required, or to develop or revise instruction. A list of the duties and tasks to be performed is the basis for ISD.

Description of the Process: Define Requirements (Step 2)

The developer analyzes the Job-Performance-Requirements Data; the process of determining what instruction, and how much of it, is needed, starts with an analysis of the job performance requirements. The developer compares the job-performance-requirements list that has been prepared with what is known about the ability of the people who will have to to the job. This comparison should show whther or not there is a need for instruction. If instruction is needed, the comparison will also show for which tasks or portions of tasks it is needed.

If the workers can do the job properly, but are not doing so, the developer should take a hard look at the working conditions. The cause may be: lack of motivation; human relations problems; pressures for overly high productivity; inefficiently organized work area; insufficient light; uncomfortable temperature; etc.

For workers already on the job, the developer's analysis should show which job performance requirements they can't meet. These will be the job-performance requirements for which instruction will be needed; instruction will not be needed for the others.

Even for workers who don't know how to do the job, some of the job-performance requirements may be so simple that instruction is not needed. The developer analyzes those job-performance requirements which will require instruction in order to identify the associated skills and knowledge.

The developer next selects job tasks requiring instruction. These are some of the factors s/he should consider in identifying those tasks for which instruction is needed in order to support the job-performance requirements: the number of people who will do the task; the criticality of the task ("criticality" refers to the relative importance of a task to mission success); the frequency of performance; learning difficulty; the time interval between the training and the initial performance; and the extent of the trainees' prior, relevant experience. Although each of these factors should be considered separately, the developer must also consider them collectively. Thus, a task that is rarely performed might still warrant instruction if it is a critical task (for example, mouth-to-mouth resuscitation).

Another decision to be made during this step of the process is how to supply personnel who are qualified to meet the job-performance requirements. Several alternatives should be considered by the developer before undertaking the design of new courses.

1. It may not be necessary to give instruction in order to provide qualified personnel. They may be available as a result of the phaseout of another system, or as a result of surpluses in allied career areas. Another alternative is to recruit personnel who can do the job.

2. On-the-job training is a systematic use of self-study and of the craftsman-apprentice principle. OJT may be quite suitable for developing job proficiency and is often used with, or as a continuation of, instruction received in a formal course.

3. Education or training requirements can often be met through the use of existing courses that are available to the Air Force. These courses may be conducted by the Air Force, or provided to the Air Force by other government agencies, by industry, or by civilian educational institutions.

4. When it has been determined that an instructional need cannot be met through the existing course, the developer should consider modifying that course.

5. The home-study package should be used in those situations in which it is more practical to bring the instruction to the students than the students to the instruction. The home-study approach is a proven idea, and new developments in instructional technology have extended the possibilities of what can be included in such instructional packages. Slides with simple handviewers and audiotape cassettes make the use of multimedia packages quite feasible. Programmed instructional techniques can make the instruction student-centered and individualized. Simple responder devices can give prompt feedback to the student going through the instruction. Through use of the ISD process, instructional packages can be produced with the confidence that they will do what they are intended to do.

6. A job-performance aid or set of aids may give all the instruction necessary in some situations, and avoid the need for formal instruction. Job-performance aids can assume many forms. The plate on a gas heater that gives instructions for lighting the heater is a simple job-performance aid. The Decision-Logic Table is another form of job-performance aid that is fairly common.

When these methods for providing the task situation with personnel who can meet the job-performance requirements have been considered and rejected, the developer is left with the decision to develop an instructional package in the form of a formal course of instruction.

There are several criteria and constraints affecting the selection of methods for supplying qualified personnel which the developer must weigh in deciding which of the above methods to use:

1. How many trained people will be needed and when will they be needed?

2. What is the probable range of relevant aptitudes, experiences, and skills among the segment of the population which would be used as trainees, if training is selected as the method? (This information can affect course content, course length, and equipment and facilities needed. It also helps in deciding if existing courses can be used.)

3. How much time will be available to develop and start instruction? If there isn't enough lead-time, the developer may have to purchase instruction, or hire trained people to do the job, until there is time to develop Air Force instruction or until the instructional requirement ceases to exist. (If instruction is to be bought, whatever information has been gathered relating to Steps 1 and 2 of the ISD process will provide useful guidance in specifying what the contractor is to provide.)

4. How many qualified instructors will be needed to develop and conduct the instruction? If instructors are not available, 9 to 12 months must be allowed for obtaining the personnel and qualifying them as instructors. If the prospective instructors must also become technically qualified in the subject-area to be taught, even more time must be allowed in order to obtain proficient instructors. The developer must also consider the availability of the personnel needed to conduct the detailed planning and development of the instructional system.

5. Will equipment and facilities for conducting the instruction be available? Decisions about the instructional methods to use may be influenced by the need for, and the availability of, equipment and facilities. Although a detailed instructional design has not yet been produced, the developer usually already can identify the requirements for facilities and major items of equipment. Getting these resources usually requires lead-time for their development and installation. So, first, the practicality of modifying the equipment and facilities that are already available should be considered.

6. What would be the programmed student load? This is the number of students that must be in a course at any one time in order to satisfy the need for trained personnel. For example, when considering the use of an existing course, the developer should check on that course's capability for handling more students. If it is already operating at its maximum capacity, an increased student load will create a need for more instructors, equipment, or facilities.

7. What will it cost? This factor is presented last since almost all the other considerations have an impact upon it. The developer should evaluate each of the possible means for providing qualified personnel in terms of its economy, effectiveness, and timeliness for meeting needs. The cost factor is quite important when comparing the advantages and/or disadvantages of bringing the student to the instructional activity as opposed to taking the instruction to the student. Cost must always be considered in context with quality of training. The developer's **goal must always be to develop and to give quality training at the least cost.**

The developer cannot determine the total resources needed until Step 3 and 4 of the ISD model have been completed. However, because the planning for many of these resources must be accomplished many months before they are needed, the developer may have to identify some of the resource needs before Steps 3 and 4 have been completed. These will include:

a. System-peculiar or unique equipment.
b. Facility needs (if the construction or modification of existing structures will be required).
c. Personnel.
d. Funding.

At this stage, the developer will have determined the job performance requirements. S/he can now identify, at the major-task level, the instruction to be provided. For this purpose the Air Force uses, as the primary course-control document, an instructional standard. These standards are specialized publications used to standardize and control instruction. They are also the means for coordination between those who are responsible for instruction and the organizations for whom the instruction is conducted. Such coordination helps to ensure that the instruction is designed to meet the client organization's needs. Within the instructional standards, by means of task and knowledge statements, the instruction needed to qualify personnel to do the job is listed. These listings are the quantitative requirements to be met by the instructional system. Instructional standards are also qualitative. They show the level of proficiency to be developed for each task or knowledge.

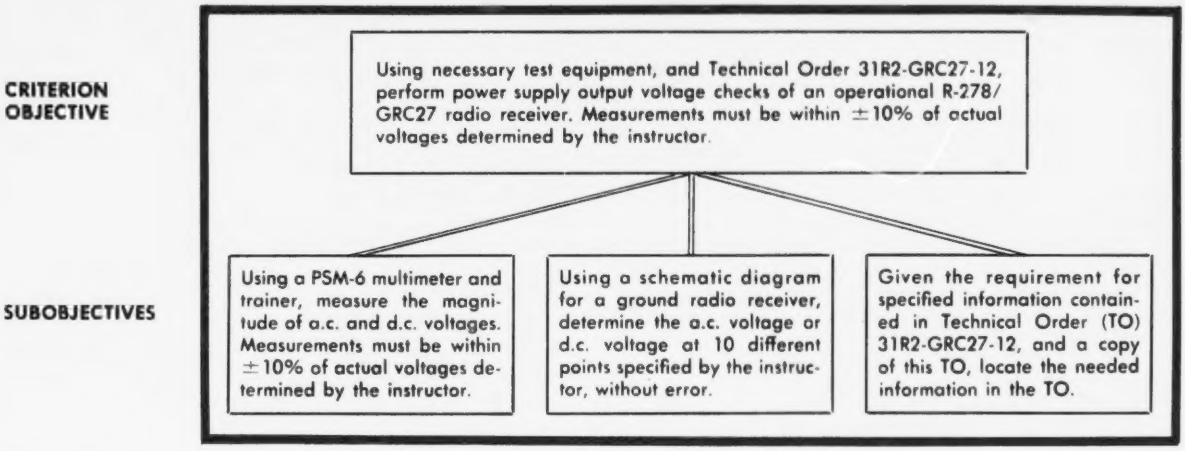
Description of the Process:
Develop Objectives and Tests (Step 3)

Developing Objectives

The learning of a physical skill requires experience in performing that skill. Mental habits are also learned through practice. Even attitudes are developed or modified as a person reacts emotionally to a stimulus. This means that for learning to take place, the learner must be actively involved in the learning situation.

Learning Cannot Be Directly Observed

But it can be inferred on the basis of how the learner behaves following instruction compared



Using necessary test equipment, and Technical Order 31R2-GRC27-12, perform power supply output voltage checks of an operational R-278/GRC27 radio receiver. Measurements must be within ±10% of actual voltages determined by the instructor.

Using a PSM-6 multimeter and trainer, measure the magnitude of a.c. and d.c. voltages. Measurements must be within ±10% of actual voltages determined by the instructor.

Using a schematic diagram for a ground radio receiver, determine the a.c. voltage or d.c. voltage at 10 different points specified by the instructor, without error.

Given the requirement for specified information contained in Technical Order (TO) 31R2-GRC27-12, and a copy of this TO, locate the needed information in the TO.

Figure 38-3. Levels of objectives.

with the way in which s/he behaved before instruction. The person who has learned something is somehow different from the same person before the learning took place. The person's behavior is different. Since instruction should shape the desired behavior, the objectives of that instruction should describe the behavior to be shaped. Also, observable behavior is what must be used to judge whether or not the instructional objectives have been achieved.

An objective is a precise statement which answers the question, what must the student do in order to show that s/he has learned what s/he was expected to learn? It specifies a behavior to be shown. For the statement to be understood in the same way by all who work with it, it must also include the minimum standard of performance or proficiency expected, and the conditions under which that proficiency is to be shown.

Levels of Objectives

The developer can specify objectives for basis skills and knowledge, and also for more complex skills which represent combinations of these basics. Together, they form a "pyramid of objectives" (Figure 38-3).
Each of the sub-objectives in Figure 38-3 could, in turn, be further broken down.

Source of Objectives

The developer should draw the instructional objectives from the education or training requirements which were identified in Step 2. Thus, the objectives in Figure 38-3 were established to support the following job performance requirement, which was determined to require training: Perform power output voltage checks of an operational R-278/GRC27 radio receiver, using technical orders and necessary test equipment.

Identification of Supporting knowledge and Skills

Once the developer has written the objectives, s/he can identify the knowledge and skills which support each objective. S/he examines each objective in order to discover the intermediate steps (sub-objectives) in the learning process which must be reached before the student can successfully accomplish the objective. Some of these sub-objectives involve skills which must be mastered before an objective can be met. Others pertain to specific concepts, principles and facts which must be learned. The developer can identify the required knowledge and skills through a behavioral analysis.

Identifying the skills and knowledge necessary to meet an objective is not a simple process. Because skills can be seen and knowledge cannot (and therefore must be inferred), it is more difficult to identify precisely what knowledge is needed to do a job-task than to identify the skills required. The only knowledge which should be included in an instructional program is that which is needed to do a job-task or tasks (either manipulative or mental).

The following list of questions will help to identify job and task behaviors for which knowledge may be needed. The questions do not provide a means for determining what specific knowledge is needed in order to perform a task. Rather, they are intended to help the developer in the identification of those job activities in which knowledge is likely to be of use to the student.

1. Is a knowledge of nomenclature and location of parts required?
2. Are safety precautions involved?

3. Is the interpretation of symbols or signals necessary?
4. Do calculations have to be made?
5. Are the techniques of problem-solving, diagnosing, and trouble-shooting required?
6. Does the task require the anticipation of later conditions based upon earlier conditions?
7. Is planning needed in order to perform the task?
8. Is the selection of strategies involved?
9. Must the task be performed in accordance with briefing instructions?
10. Is the use of tools and general test equipment required?
11. Is knowledge of the "why" of a procedure essential?

Developing Tests

Defining objectives is only a part of step 3. The other part is to develop a means of testing by which to measure the attainment of these objectives. These are called criterion tests because they test against the criteria for a successful performance which were identified in the objectives. With a criterion-referenced test, students are rated on their ability to achieve the objectives. How others score on the test has no bearing upon an individual's grade. (This is in contrast to the norm-referenced test, in which a student is graded on how well s/he does in comparison with other students.)

Each criterion test item should be based solely upon the requirements specified in the objective for which it is to be a measure. In fact, the wording in both the test item and the objective may be the same. In an automotive course, for example, one may find the following criterial objective: "Using an electrical test set, adjust the voltage regulator until the volt-meter indicates 14 volts, within a tolerance of ± .2 volt." In this case, the objective itself is a good test item; in other cases, some rephrasing may be necessary. In any case, a test item should require students to respond only as specified in the objective, under established conditions, at or above the minimum level of acceptable performance.[3] The objective cited above requires the students to do the task. The corresponding test item should require the same performance[4] by the students--not merely have them to state the procedures that are involved in the adjustment of the voltage regulator.

When the developer has established the objectives and constructed the criterial test items to measure them, the objectives and test items must be approved by the proper authority. After that, the instruction to enable the students to reach that target must be designed. The objectives clearly define the target, and the criterial test items provide a means for determining whether or not the instruction accomplishes what it should.

The developer will also have to construct test items to measure whether the students have learned the supporting skills and knowledge which contribute to their ability to perform the objectives. As with the criterial test items, these diagnostic test items should measure precisely what is to be taught - no more, no less.

During validation, the instructional system designer can use diagnostic test items to predict success, to identify problem areas, and to adjust instruction for unanticipated individual differences. Once the instruction is validated, it would seem that there would be no further need for the diagnostic tests. For if the student can pass a criterial test item, this should prove that s/he has mastered the component skills and knowledge. However, if the instructional testing of a validated program is limited to criterial test items, there can be a delay before it is found that a student has not learned. Judicious use of diagnostic tests is appropriate, and will help in avoiding this problem. But the extensive use of diagnostic tests during instruction, after that instruction has been validated, is expensive in terms of time and effort and is unnecessary.

The survey test is a most important part of the instructional design process. Survey tests are used to determine what the prospective students (the target population) already know or can do before receiving instruction. Survey tests should not be confused with pretests, though their design may be similar. The administration of the survey test while the instructional system is being developed will provide valuable clues for conducting this development. The results of the survey test will aid in deciding for which objectives instruction is needed and which objectives can be dropped because the student population has already learned them. For example, if you find that nearly all of a sample of prospective students can do a particular task or that they know a certain piece of information, then this skill or knowledge may not have to be taught. But, if few can show mastery of a particular skill or knowledge, then more than likely you should include the corresponding objectives in the instruction. Before deciding to drop instruction because many of the students already have the skills and (or) knowledge, consider such factors as:

-- How can instruction be economically provided to the few who do need it?

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[3] Minimum level of acceptable performance does not imply weak or inadequate performance. The minimum acceptable performance may be perfection.

[4] Performance is not limited to physical manipulation, such as writing or welding. There also is performance when one adds numbers, makes a judgment, etc. Performances of the latter kind can only be observed indirectly, as when the sum of the numbers, or the judgment, is written or spoken.

-- Are there seasonal variations in the aptitudes of the prospective students?

-- How difficult is the task to learn?

-- How critical is the task to mission success?

The survey tests include items selected from the criterial tests. In the optimal case, the ability to meet all criterial objectives should be measured. In addition, the test should survey related abilities of the target population, such as grade level in reading, ability to make mathematical calculations which are involved in job tasks, etc.

Pretests are used when individualized instruction is used. The pretest should measure the individual student's ability to meet each criterial objective. It is given to each student before instruction. How well the student does on the pretest determines what instruction that student is given.

In summary, it can be said that objectives represent the specific intent of instruction in terms of behavioral end-products based upon job requirements. Sub-objectives establish the intermediate skills and knowledge necessary to satisfy the requirements of the criterial objectives. In and of themselves, objectives have little significance if tests are not developed which will measure the behaviors specified by the objectives, or if these are not used to validate the success of the instructional system; these are the two functions of criterial tests. When practical, survey tests should be used in determining which objectives should be kept in the instructional system. Also, pretests should be prepared at this time if it is anticipated that an individualized instructional design will be chosen in the next step. Once these activities are completed, the developer can plan, develop, and validate instruction.

Description of the Process: Plan, Develop, and Validate Instruction (Step 4)

To perform this step requires the careful planning of instruction to satisfy the objectives. This involves the placing of the learning activities or exercises in such an order as to produce the required learning in the shortest time. It also involves the placing of the learning activities or exercises in such an order as to produce the required learning in the shortest time. It also involves the selection and planning of those instructional methods, media, and equipment which most effectively support the learning objectives. These planning activities will provide the developer with the information needed in order to identify resource needs. This step also includes the development and validation of the instructional materials. The validation process certifies that the instructional materials and the instructional methodology combine in such a way as to teach the students what they need to know. Validation is conducted through a series of tryouts with students in which the criterial test items are used as the measuring device. Any portion of the instruction which fails validation during these tryouts must be changed until it succeeds.

Planning and Developing Instruction

Learning is defined as a change in the behavior of students as a result of their experience. In accomplishing steps 1 and 2 of the ISD process, both the desired behavior (job performance requirements) and the current capabilities of the target population were identified. The difference between the two is the learning deficiency that must be made up through instruction. This instructional requirement was then described through a set of objectives (Step 3). Now that it is known what behaviors must be shaped, the developer must plan the means for shaping them. This planning should employ the following concepts in order to effectively manage the learning process.

1. **Active student participation.** The instructional designer and the instructor can only arrange for learning to take place. It is the students who do the learning. They learn by doing, thinking and feeling--by answering questions, discussing, computing, manipulating, putting ideas together, etc.--within the context of an appropriate specific activity. Until the students have applied in an appropriate way what they were taught, it is risky to assume that they have learned. Learning is an individual process in which students gain knowledge and skills and shape attitudes through their own activities, experiences, and motivation.

2. **Confirmation (knowledge of results).** As the students participate, through various types of responding, it is helpful to them (that is, makes for more efficient learning) to know how well they are doing. Confirmation consists of informing the students whether or not their responses are correct.[5] This kind of feedback may also provide a valuable source of motivation.

3. **Planned pacing.** The rate at which students go through an instructional sequence is referred to as pacing. There are several ways to pace students' progress. Traditionally, instruction has been presented in a group-paced fashion; that is, all of the students in the class were given the same instruction at the same time. There are some learning situations in which group-paced instruction is appropriate, and others in which the instruction would be self-paced.

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[5] Reinforcement is often associated with confirmation, but the two terms are not synonymous. Reinforcement has a special effect on behavior. It makes that behavior more likely to occur again when the same stimulus is present. Confirmation may be a means for providing reinforcement, but it is not the only means.

Not all students can reach the required level of performance of a task in the same amount of time. Because of varying ability, background and motivation, some will learn faster than others. Ideally, then, the instructional designer would plan for each student to go through the instruction at a pace best suited to that student. Where it is possible to use self-paced instruction, a savings in instructional time will usually result. Another benefit is that each student reaches the specified level of proficiency.

It may not be practical to use only group-pacing or only self-pacing for a whole course. Fortunately, many instructional systems can employ a combination, using group-pacing where necessary and providing self-paced instruction when possible.

There are several techniques for providing planned pacing. Proficiency Advancement is a technique which can be used to advance students who have prior knowledge, who have practical experience, or who are exceptionally fast learners. Students demonstrate their proficiency by passing the criterial test for a particular instructional sequence. Students are advanced through each sequence for which they have passed the criterial test.

By having two, three, or four alternate tracks of instruction, it is possible to choose the track best suited to each student's needs and abilities. Usually, the placement of students in these tracks is determined by the use of a pretest. Multiple tracks could also be used when it is known that, following graduation, the students will have different assignments, and it is known which students will get which assignments. In this situation, all students receive that portion of the instruction which is common to their needs. Then they are divided into groups, and each group receives that instruction which is appropriate to its specific assignment.

In modular scheduling, the instructional system is divided into units of instruction called modules. Each module covers one or more objectives. Students are pretested and counseled to determine their particular instructional needs. Pretest results and information gained through counseling are analyzed in order to determine the specific modules needed by each student. Then an individual program is designed for each student. Structuring a course in this way will eliminate from each student's schedule that instruction which is not needed and can reduce average course length.

Self-paced instruction involving programmed texts and other programmed instructional materials can be used in such a way as to let each student progress through the instruction at her/his own pace. These programs can be designed either to involve the assistance of an instructor or to be used independently. Materials that do not require any instructor assistance can be used for out-of-class study.

Learner-controlled instruction has been used successfully in situations in which students are highly motivated, with one of the desired ends of instruction being that the students develop self-reliance and initiative. In learner-controlled instruction, the students are given the set of behaviorally-stated objectives and a test item for each objective so that they can determine when they have met the objectives. They are told what learning resources are available and where they are. The students are free to use any part, all or none of the resource materials as they deem necessary. When they feel ready, they go to the instructor to take the unit test.

Instructional Increments - Sequence and Size

Since the objectives provide the framework for the structure of the system, the sequencing of the order in which the objectives are taught is a very important part of system development. The sequence of instruction can greatly affect the motivation of a student. Sequencing can show relationships which can be used to make instruction more meaningful. Obviously, the more meaningful the content, the easier it is to learn. Proper sequencing avoids unneccessary duplication in course content. It also prevents gaps in instruction and makes sure that the development of a skill is orderly; i.e., that prerequisite knowledge and skills have been learned before the introduction of more advanced subject-matter or the performance of more complex tasks. The developer can sequence course content in any of several ways: job performance order, psychological order (from the simple to the complex, the known to the unknown), logical order, or a combination of these.

Another important concern in ISD is the optimal size for each increment of instruction. We use the term "optimal" to indicate that exact amount of instruction which is necessary in order to produce the desired results. The natural tendency is to "play it safe" and provide more instruction than is necessary. This causes the training to cost more than it necessarily must, and may cause boredom, especially among the more able students. The best approach is to begin with a minimal amount of instruction, and to rely upon the validation of the instructional elements to show where more instruction is needed. This process, plus feedback obtained from the evaluation of instruction already validated, is used to determine the optimal amount of instruction. If more instruction is provided in the beginning than is necessary, there will be no good indication of what can be eliminated.

Selecting Instructional Methods

While we must discuss the selection of instructional methods and the selection of instructional media separately in this chapter, methods and media cannot really be considered independently. The only meaningful question is: Which method-and-media combinations are the most effective for given instructional purposes?

After the instructional objectives have been specified, the essential knowledge, skills, and attitudes to be learned in order to meet each objective must be identified. Once these have been identified, the instructional methods and media to be used in teaching them can be chosen. One way to do this is to relate the behaviors involved to one or more of the types of learning. (An instructional objective can involve more than one type of learning.) The types of learning, with examples of each, have been listed in Table 38-2. The first six types of learning listed in this table have to do with knowledges; these have been placed in a sequence, beginning with the least complex ("association"). The next higher type of learning is the forming of chains. Chains are simply two or more associations linked together. Each of the higher types of learning involves all of the lower types. Some instructional methods and media are more effective than others in facilitating a particular type of learning. So, once the type of learning involved has been identified, an appropriate instructional method and medium can be chosen.

In choosing the instructional method(s) to use to teach a particular skill, knowledge or attitude, the developer should consider the type of learning involved (Table 38-2). Probably, this will still leave several alternatives. Student differences and the availability of time and resources will determine which alternative is most appropriate.

Selecting Instructional Media

We use the term **instructional media** to refer to the different means used to provide information to the student. Examples would include a classroom instructor, a book, a flight simulator, a computer terminal, pre-narrated slides, actual items of equipment, or television. Properly selected instructional media provide some of the physical circumstances required for proper initial learning and for later practice of the knowledge, skill, or attitude to be gained. The necessary information for helping students learn can be provided through a wide variety of instructional media, and through various combinations of these media. A properly designed procedure or strategy for meeting a training objective must perform three functions: present information, provide practice, and provide feedback to the student. Many different instructional media can be used in performing each of these functions with equal effectiveness. As long as the courseware (such as motion picture films, video programs, programmed instruction booklets, or pre-narrated slides) and the training exercises provide all the information that students need, at a rate at which they can learn--so long as this situation prevails, it does not make any instructional difference which medium is used. The choice between media of the same instructional effectiveness is then based upon other considerations, such as cost, maintainability, etc.

The design of student exercises, performances, or practice items should be based upon what has been determined to be necessary for the student to do in order to assure that the satisfactory transfer from the learning situation to the job will occur. This student activity may range from a verbal response in a classroom, or filling in the blank in a programmed instruction booklet, to operating a Minutemen Missile Procedures Trainer or the C-5 Flight Simulator. Many tasks should be learned under conditions resembling those to be found on the job, with equipment identical with that found on the job. However, high cost, safety, and limited resources often prevent the use of actual equipment in a job-like environment. Too, a well-designed instructional program may use techniques which make the instructional environment physically unlike the job environment in order to make the instruction more effective. Such techniques include:

-- Using more feedback during training than is normally provided on the job (giving the students more knowledge of the results of their activities than they would receive on the job).

-- Providing many more crises, conflicts, equipment breakdowns, or emergencies at shorter time intervals than is normal to the job environment.

-- Reducing the normal length of time taken by events so that there will be more training time left for the students to practice the critical parts of the tasks involved.

-- Providing small amounts of practice on selected aspects of similar tasks rather than practicing each of these tasks separately, thus increasing the effective use of limited practice time.

-- Providing aids, prompts, or guidance during learning. Sources of prompting information include aids that are a part of the training task or job task, job aids (including checklists, picture guides, or other specially designed aids for training), a classroom or field instructor, a classmate (peer), a mediated program (such as an automated apprenticeship training approach, handouts, and other resources. Some actual equipment is not suitable to use in training because it isn't designed to take as much abuse as it would receive from students. The problem of stripped threads in "remove-and-replace" training exercises using actual equipment is an example of this design problem in training.

A first step in media selection is to decide which level of resemblance to the job the active learning environment should display. Generally, it is best to have the instructional situation as similar as possible to the job situation. But there are exceptions. Sometimes in the early stages of instruction, resemblance to the job is not desirable. As an example, consider the student who is learning to recognize different forms of bacteria. S/he could be started off with a microscope and actual stained slides--which is the job environment.

Table 38-2. Types of learning.

TYPE	PERFORMANCES RELATED TO DIFFERENT TYPES OF LEARNING
Forming Associations	Involves associating, naming, or responding to a specific input (stimulus). The person associates the response with a specific input only. The response may be vocal, subvocal (say-it-to-yourself), written, or motor. **Examples:** Naming objects you see; stopping at a red traffic light.
Forming Chains	Involves recalling sequences of actions or procedures which must be recalled in a **specific order.** In a chain the response to one input becomes the input to the next response. May involve chains of verbal responses or chains of motor responses. **Examples:** Verbal chain: reciting a memorized poem; stating a rule. Motor chain: tying a shoelace; starting an aircraft engine.
Making Discriminations	Involves making different responses to the various members of a particular class; being able to distinguish among input information sources and/or types and then to respond appropriately to each. **Example:** Recognizing the differences among similar gauges on an instrument panel and reacting appropriately with a vocal, subvocal, written, or motor response.
Making Classifications	Involves responding in a single way to all members of a particular class of observable or abstract events. This involves recognizing the essential similarity among a class of objects, people, events or abstractions, and recognizing the differences which separate those objects, people, events, or abstractions which are not members of the class. **Example:** Classifying aircraft as being tactical, fighter, transport, etc.
Using Rules	Involves applying rules to a given situation or condition by responding to a class of inputs with a class of actions. A rule states the particular relationship between two or more simpler concepts. It is helpful to think of rules as "if-then" statements. **Example:** If a metal rod is heated, then it will expand.
Problem Solving	Involves comparing previously learned rules to create a higher order rule. **Example:** Troubleshooting a malfunction in an aircraft radar system. (Many rules are involved in tracking down the specific malfunction.)
Performing Skilled Motor Acts	Involves manipulative tasks which require the smooth, integrated use of eyes and hands. Often this skill entails variations in the actions, where one action will be dependent on the results of other actions. **Examples:** Making a sensitive adjustment that requires precise timing; shooting a rifle accurately; driving a golf ball.
Exhibiting Desirable Attitudes and Opinions	Involves enhancing an individual's preference for a particular point of view, idea, or course of action. **Examples:** A willingness to obey traffic rules in the absence of authority; exercising safety practices on the job; desiring to master the skills being taught.

But that would make the instruction unnecessarily difficult because this medium contains much that is distracting. An alternative is to start the student's instruction with slides showing an artist's representation of the bacteria, using idealized forms and colors, and with no stain debris. As the student advances in her/his training, a transition is gradually made in the slides toward realistic job conditions, and in the **final** stage of instruction s/he uses the microscope and actual stained slides.

Table 38-3 can be used as an aid in making preliminary media decisions. This table shows the types of learning (from Table 38-2) in relation to representative instructional media. The instructional developer should be able to relate any instructional objective to one or more of the types of learning. The table can be used to rule out inappropriate options, so that the developer can make realistic trade-offs in the selection of instructional media for the training systems.

There are other factors, too, that should be considered in selecting media:

-- Equipment for instruction should be easy to set up and to operate.

-- When individualized instruction is the instructional method, the media used must permit the student to control the rate at which instruction is presented.

-- Spoken words and moving pictures are transient. If the capability to repeat them is required for effective individualized instruction, then the media devices selected should have that capability.

-- The number of students to be trained and the location of the students (all at one site, or at many locations across the country) will affect the quantity of media, materials, and resources needed.

Two important questions remain. Though they involve non-instructional considerations, the answers to these questions will affect the choice of media: (1) Who (what organization) will develop, produce, and revise the courseware that is needed? Do they have the facilities and the qualified personnel to do the job? If not, what new facilities, overhead costs and personnel will be needed? (2) How will the media devices that are selected (the hardware) be obtained and maintained? What is needed must be matched with what can be procured. That involves both the availability of the hardware and the length of time it would take to procure it. Since different instructional media can be equally effective in presenting the selected information, these two questions may become decisive factors in making the final choice.

In deciding which media to use, the overall consideration must be, what will permit accomplishing the mission with maximum cost effectiveness? Each of the media-selection considerations already discussed have a bearing upon this decision.

Determining Resource Requirements and Costs

During this step, the developer must also identify total resource requirements. Figure 38-4 lists the types of resources and cost factors that must be considered in developing the instructional system.

Developing Instructional Materials

Another important activity involved in this step of the model is that of developing the most effective instructional materials to support each teaching-learning activity. These materials include such items as texts, student study-guides

TYPES OF RESOURCES AND COST FACTORS

RESOURCES

- EQUIPMENT
  - Instructional
  - Support
- FACILITIES
  - Classrooms
  - Laboratories
  - Special-Purpose
- MANPOWER
  - Instructors
  - Instructional Administration and Supervisors
  - Base Administration and Support

COST FACTORS

- DEVELOPMENT
- INVESTMENT
  - Equipment
  - Facilities
- OPERATION AND MAINTENANCE
  - Equipment
  - Facilities
  - Pay and Allowances

Figure 38-4. Typical resource and cost factors.

Table 38-3. Representative instructional media suitability for elements of learning strategy.

LEARNING OBJECTIVES AND ELEMENTS OF LEARNING STRATEGY >	ASSOCIATIONS & DISCRIMINATIONS			VERBAL CHAINS			MOTOR CHAINS			CLASSIFYING, RULE USING & PROBLEM SOLVING			PERCEPTUAL-MOTOR SKILLS			ATTITUDES, OPINIONS & MOTIVATIONS		
REPRESENTATIVE INSTRUCTIONAL MEDIA	PRESENTATION	PRACTICE	FEEDBACK	PRESENTATION	PRACTICE	FEEDBACK	PRESENTATION	PRACTICE	FEEDBACK	PRESENTATION	PRACTICE	FEEDBACK	PRESENTATION	PRACTICE	FEEDBACK	PRESENTATION	PRACTICE	FEEDBACK
CLASSROOM INSTRUCTOR																		
Lecturer	YES	NO	NO	YES	NO	NO	P	NO	NO	YES	P	P	NO	NO	NO	YES	P	P
Demonstrator	YES	NO	NO	YES	NO	NO	P	NO	NO	YES	P	P	YES	NO	NO	YES	P	P
Tutor/Coach	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Teaching Interview	YES	NO	NO	YES	NO	NO	NO	NO	NO	YES	NO	NO	NO	NO	NO	YES	P	P
INSTRUCTIONAL AIDS																		
Overhead Projector	YES	P	P	YES	P	P	YES	P	P	YES	P	P	P	NO	NO	YES	P	P
35mm Slides	YES	P	P	YES	P	P	YES	P	P	YES	P	P	P	NO	NO	YES	P	P
Chalkboard	YES	NO	NO	YES	NO	NO	YES	NO	NO	YES	NO	NO	NO	NO	NO	YES	NO	NO
8mm Movie (silent loop)	YES	NO	NO	YES	NO	NO	YES	NO	NO	YES	NO	NO	YES	P	P	YES	NO	NO
MULTIMODAL MEDIA																		
Prenarrated Slides (with stop)	YES	YES	YES	YES	YES	YES	YES	YES	P	YES	YES	YES	YES	YES	P	YES	YES	P
Prenarrated Filmstrip	YES	P	P	YES	P	P	YES	P	P	YES	P	P	YES	P	P	YES	P	P
Slide/Workbook/Audio cassette	YES	YES	YES	YES	YES	YES	YES	P	P	YES	YES	YES	YES	P	P	YES	YES	YES
Movies (sound)	YES	P	P	YES	P	P	YES	P	P	YES	P	P	YES	P	P	YES	P	P
TV (cassette)	YES	P	P	YES	P	P	YES	NO	NO	YES	P	P	YES	P	P	YES	P	P
PRINT																		
Books	YES	P	P	YES	P	P	YES	P	P	YES	P	P	P	NO	NO	YES	P	P
Computer (words & numbers only)	YES	P	P	YES	P	P	YES	P	P	YES	P	P	NO	NO	NO	YES	P	P
Programmed Instruction Booklet	YES	YES	YES	YES	YES	YES	YES	P	P	YES	YES	YES	P	NO	NO	YES	YES	YES
Microfiche	YES	P	P	YES	P	P	YES	P	P	YES	P	P	P	NO	NO	YES	P	P
PEER																		
Role Playing	P	P	P	P	NO	NO	N/A	N/A	N/A	P	YES	YES	N/A	N/A	N/A	YES	YES	YES
Discussion Group	P	P	P	P	NO	NO	N/A	N/A	N/A	P	YES	YES	N/A	N/A	N/A	YES	YES	YES
Tutor/Coach	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
SIMULATION																		
Actual Equipment Trainer	NO	P	P	NO	NO	NO	YES	YES	YES	NO	YES	YES	P	P	P	N/A	YES	YES
Gaming	NO	P	P	NO	NO	NO	N/A	YES	YES	NO	YES	YES	N/A	N/A	N/A	N/A	YES	YES
Interactive Computer (plasma terminal)	YES	YES	YES	YES	YES	YES	YES	P	P	YES	YES	YES	N/A	N/A	N/A	YES	YES	YES
Case Study	NO	P	P	NO	NO	NO	NO	NO	NO	YES	YES	YES	NO	NO	NO	YES	YES	YES
ACTUAL END ITEMS	NO	P	P	NO	NO	NO	YES	YES	YES	NO	P	P	P	P	P	YES	YES	YES

CODE: **YES**—is effective
NO—is not effective
P—under certain circumstances, effective use is possible; or, there are inherent limitations in the effective use
N/A—use of the media is inappropriate

and workbooks, instructor guides, slides, tape recordings, charts, and case-study scenarios.

Before preparing new material, check the availability and suitability of existing publications and aids. Suitability should be based upon an analysis of the objectives in order to determine what knowledge and behaviors the student should gain through the use of the material. Commercial self-instructional materials are available on a wide variety of subjects. The other military services have also developed self-instructional materials, many of these in subject-areas that are common to the Air Force. Other publications, such as manuals, technical orders, and manufacturer's handbooks for specific equipment, should be reviewed for possible use. Some of these may need little or no supplemental guidance for use by the student; they are quite appropriate for instructional use if they are the same materials the student will use on the job. Often the use of adjunct programmed-instruction techniques can make these materials quite useful for instruction. Air Force and commercial self-instructional materials and other instructional publications and audiovisual packages can be identified through the use of military and commercial indexes, bibliographies, and catalogues.

When it is necessary to develop new materials, the objectives these materials must support and the students for whom they are being made must be kept in mind. Since the most effective instruction is student-centered, techniques consistent with the principles for effective learning must be used. The materials must be so constructed that the students will be attentive. Their attention can be ensured by requiring them to make specific responses to the presentation; these responses can involve requiring students to answer relevant questions, operate a piece of equipment, or make some other kind of observable, measurable behavior. The materials must move them in the direction of the criterial behavior and guide them toward mastery. By carefully planning the stimuli to which the students will be exposed, and by proper use of reinforcement theory, the developer can shape the desired behaviors.

The instructional materials produced by the developer should be edited for technical accuracy by subject-matter experts. This editing should not be restricted to a review of technical content, but should include such features as the adequate use of tools, appropriate safety precautions, adequate indications of supervision, and the following of major command policies. The materials should also be edited for composition. The editing should be concerned with the ability of the instructional materials to communicate. Do they use language which the learner understands? Are they free of unnecessary repetition and ambiguity?

Validating Instruction

Thus far in the instructional system development process, the objectives and criterial tests have been developed; appropriate methods of instruction and appropriate media have been selected; instructional content has been sequenced; and instructional materials which will most effectively support the learning process have been developed. Still, there is no assurance at this point that all this effort will result in effective instruction. It must be proven that students who have received this instruction will acquire the necessary job skills and knowledge. The test items which were developed in order to measure the objectives are the means to determine whether or not the instruction is effective. This process of proving the effectiveness of the instructional components, and then of the total system, is called validation. Each step in instructional system development is validated by checking student performance against the performance criteria.

Validation is a powerful tool for use in refining instruction. Use it. It is best not to wait till the complete instructional system is developed and then test it all at once. Rather, test portions of it as they are produced.

The system is developed unit by unit and is tested or validated on the basis of the objectives for each unit. This validation process validates the particular combination of instructional materials, media, and methods that was used. Instruction that cannot meet validation requirements may fail because any or all of these--materials, media, methods--were wrong choices or were not properly developed.

Ideally, the first step in the validation process, following the preparation of a small instructional unit, is to test its effectiveness on individual students who are representative of the students for whom the instruction is being developed. The students selected for the purpose of validation should fall within the range of aptitudes, prior knowledge, skills, and backgrounds of the typical input population. Preferably, those selected should fall within the upper range of aptitudes. If they have trouble learning the material, it would be too difficult for the less-capable students. Also, the student with higher ability may point out weak areas in instruction. Moreover, if the initial presentation were to be given to students scoring in the lower range of aptitudes, and they did well, it would be hard to assess the relative difficulty of the lesson. It is simpler to expand material to make instruction more effective, than it is to determine what material to leave out in order to achieve the optimum level and quality of instruction.

Conduct several individual tryouts before you make any significant technical changes. Then conduct a try-out on a group of students. The reason for trying out instruction on a group of students is to see how that part of the instructional system works under conditions approximating the actual classroom situation. So, the validation efforts should be expanded to groups of 6 to 10 students as soon as satisfactory results are obtained with individual tryouts.

The small-group tryouts should be continued until a total of 20 to 30 students have been through the instructional sequence. The students selected for this phase of validation should also represent the target population. The selections should include, insofar as possible, an even distribution of low, average, and high-aptitude students.

At this point in validation, time becomes a factor. It is not sufficient that students learn the material in an instructional sequence; they must also complete it within a reasonable period of time. Therefore, during small-group tryouts, the time needed by each student to complete an instructional segment should be tabulated along with the students' scores.

The final stage of the validation process is not usually conducted by the developers, but by the personnel who will have to operate the system. The length of the sequence will vary. It may be a portion of an instructional block, a complete block, or an entire course of instruction. Availability of time and resources will, to a great extent, dictate the scope of the instructional area undergoing a final operational tryout.

There are several reasons why it is desirable to conduct a complete tryout. First, though the small segments of instruction have proven successful, they have only been validated in an isolated environment. Now they must be evaluated as integral parts of the total system. Second, the analysis of the data gathered from this larger sample population will form a solid basis for final revision and refinement of the system. Third, it will provide an opportunity to work out administrative, equipment, facility, or other implementation problems and to update the course control documents as required.

Each of the three steps in the validation of instruction provides valuable information, so every effort to conduct them should be made. If the whole validation process can't be used, as much as possible of the process should be used. Still, there will be situations in which the students are not available until the course starts, and there is no practical way of getting substitutes for the students in order to conduct a realistic tryout. When this happpens, as much of the validation data as possible should be gathered from the students in the first few classes. If possible, a waiver on the course length should be obtained for these first few classes, so that some extra time may be available at the end of a unit of instruction to be used by the students in carefully critiquing that portion of the instruction.

The fourth step in the model calls for the developing and validating of instruction to be sure that the objectives of a course can be effectively and efficiently fulfilled. This involves the sequencing of teacher-learning activities in order to provide the best possible learning environment. The planning also includes the selection of the most appropriate instructional methodology, equipment, and aids to support these activities. The programming of equipment, facilities, manpower, and funds must be finalized so that such resources are available when required. Instructional materials are prepared, and, finally, all elements of the instructional system are tested and revised until they have been validated.

Description of the Process: Conduct and Evaluate Instruction (Step 5)

Conducting the Instruction

After the instruction has been developed and validated, it is ready to be used. Resources should be available by this time. The instructors, supervisors, and managers of instruction should be familiar with the instructional materials. They should also be familiar with their own roles and functions within the system.

Instructors must know how the system is intended to function and how they are to function within the system. This information should be provided in an instructor's guide. Management must ensure that instructors study and apply these instructor's guides. All personnel concerned must understand that arbitrary changes in the validated instruction cannot be made without endangering the effectiveness of the instruction.

There may be a need for instructor training (or retraining). Instructors faced with the task of using new teaching techniques may feel (and may be) inadequate. Therefore, course administrators must be sure that instructors receive instruction on the use of new concepts and techniques, as well as on the reason for their use.

Management must also plan for the maintenance of the system. Training literature, expendable supplies and tools must be there when needed by the students. Training devices must be kept in good condition, and a proper level of spares should be available. If the organization conducting the instruction does not have its own audiovisual equipment, it will have to schedule the use of loaned equipment. This kind of planning is always important for effective instruction, but it is critical when self-paced, individualized instruction is involved.

For a variety of reasons, instruction will need to be updated periodically. The revision of instructional materials calls for the same careful planning, development, and validation as did the development of the original instructional materials. Management must plan for the availability of adequate, qualified personnel to support this effort.

A self-paced instructional system presents management with a number of special challenges. The problem of keeping track of the status of each student--what training each student has successfully completed, what her/his special needs are, and what equipment is available to work on next--can be a big one. If there are many students involved and (or) the scheduling is complex (for example, in flying training, where scheduling is difficult since weather is uncertain), you may need a computer for the scheduling and recordkeeping.

Of course, it does no good to develop quality instructional materials and systems unless they are used properly, and unless the skills and knowledge learned by students are used. This problem involves the management of the students who are selected to get the instruction. If the students sent to the course do not have the prerequisites, not only is the students' time wasted, but the whole instructional system design effort can be destroyed. The ISD effort is also wasted if the people who are trained are not given the chance to use what they have learned.

Evaluating the Instructional System

To be sure that the students learn what they need to know, once instruction is started it must be continually evaluated. This evaluation examines both the conduct of the instruction and how well the graduates do on the job. To avoid any conscious or unconscious biasing of the findings, the personnel who conduct the evaluation should not be the same people or organization which designed, implemented or operate the system; this evaluation should be conducted by someone else. The ISD model shows that the process is a complete cycle involving feedback. This feedback is the means for ensuring continuing quality in graduate performance. If evaluation of the instruction shows a need for change, depending upon what that change is, the cycle, or some part of it, is repeated. Thus, if it is found that there is new equipment which the graduates can't handle, Step 1 should be repeated in order to identify and analyze the new job tasks; then Step 2 should be carried out again, in order to determine the instruction needed, etc. If it is found that the graduates have forgotten important information, Step 4 should be repeated in order to redesign the instruction, so that it will be retained longer. Other findings might indicate a need to alter one or more objectives (Step 3).

Despite the care with which the instructional program has been developed, it is still possible that the graduate's performance may not meet the job requirements. There may be a number of reasons for this. In the time between when the job performance requirements were determined and when the graduate arrived at the job, some job performance requirements may have changed. Or, the graduates may have forgotten some of what they learned. It is also possible that there are weaknesses in the instructional program, that the instruction is not being conducted as planned, or that students who do not have the prerequisites are taking the instruction. Through field evaluation and internal evaluation, such problems can be identified.

Internal Evaluation

The results of internal evaluation do not prove the instructional system is adequate (or inadequate), but they do point to some of the system problems and suggest areas for improvements.

An internal evaluation must start with an analysis of the instructional system control documents. The objective is to see if discrepancies exist between the instructional system as outlined in the control documents and what occurs during instructional system operation.

Internal evaluation should include checks of existing training facilities, equipment, tools, and supplies to be sure that they meet the needs of the instructional system. In addition, support facilities and services should be evaluated to determine their adequacy, condition, and maintenance.

Visits to instructional facilities for evaluative purposes should be long enough and often enough to assure the observation of representative teaching. Trainers, instructional media, and aids specified for use in the facilities should be checked for condition, operation, and appropriateness. Instructional literature should be checked for availability and quality.

The instructor's activities should be the same as what is called for in the plan of instruction (or syllabus) and in the instructor's guides. Instructors must show the proper use of instructional system technology. Instructor's records must be current, and must show the amounts of in-service and special training completed. The instructor rating sheets should be completed by the instructor-supervisors; where they show instructor weaknesses, they should also show suitable corrective actions.

This is an important source of information as to whether the system is functioning effectively.

Field Evaluation

The Internal Evaluation of all parts of the instructional system provides a basis for determining system effectiveness. But, even if internal evaluation shows no fault in planning, developing, or conducting the instruction, it is not guaranteed that the graduates will perform satisfactorily on the job. Field evaluation is also necessary. The purpose of field evaluation is to find out if recent graduates can do their assigned tasks to the level of proficiency specified in the applicable training standard. If the graduates do not need what they were taught, or do need instruction they didn't receive, this information must be fed back to the instructional system designers; there is a need to change the instruction. If the graduates cannot do some tasks sufficiently well, there may also be a need to change instruction. Perhaps there wasn't enough practice during instruction to ensure retention.

The matter of retention of instruction requires a special comment. In analyzing field-evaluation findings, indications that the graduates have forgotten some of what they were taught should be carefully investigated. The instruction they were given could be at fault, but there are several other possible causes that relate to job conditions which should be assessed. The behaviors produced during instruction must be used in the job situation or else they will disappear. These behaviors will not be used on the job if it is unrewarding or punishing to the graduate to continue to use them. A few examples will indicate some of the many possible situations:

-- The graduate is not permitted to apply on the job what s/he learned during instruction.

-- Some of the graduate's fellow workers, who have not received the instruction s/he got, feel threatened. To preserve their good will, s/he stops applying what was taught.

-- Graduates who learned how to do the task properly find that on the job others, who do a "halfway" job with much less effort, receive the same "rewards" that they do.

So, to properly evaluate the indications that the graduates haven't retained instruction, one must also know what happened to them after they completed their instruction. Otherwise it is possible to mistakenly invest time, equipment, and money in "beefing-up" instruction that is not at fault.

A field evaluation must be carefully designed and conducted to ensure the collection of accurate and valid data. The data for the evaluation may be obtained through the use of mailed questionnaires sent to the supervisor, to the graduate, or to both. It may be obtained through field visits during which the graduate's performance is observed; or the graduate and her/his supervisor may be interviewed; or both observation and interview may be used together. Another alternative is the controlled job-performance evaluation in which the graduate's performance over a specific period of time is observed, evaluated, and reported by her/his supervisor.

Questionnaires are the least expensive procedure for field evaluation and may be used to collect large samples of information about graduates. However, questionnaires may not be the most valid form of evaluation. The validity of the data gained through the use of the mailed questionnaire depends upon how well it is prepared and distributed. Questionnaires should be piloted before general use is made of them in order to be sure that those who received them understand the questions in the same way that the designer of the questionnaire does.

The main portion of the questionnaire consists of a list of task and knowledge statements, either extracted from the instructional standard which serves as the primary control document for the instruction being evaluated or paraphrased from this document. The graduates' supervisors can be asked to rate them on their ability to do each task listed in the questionnaire. A similar type of questionnaire can be sent to the graduates, asking them to indicate how well they think the instruction equippped them to meet the needs of their job. They could also be asked to check those tasks which they do not do.

For full use of the questionnaire technique of evaluation, supplemental "information-seeking" questions might be added. Such questions may ask the graduates to estimate the amount of time they spend on the different tasks or duties within their Air Force Specialty (AFS). Other questions may ask about items of equipment, materials, or procedures used by the graduates. An open-ended question could be included, asking for suggestions as to how instruction might be improved.

However field evaluation data is gathered, it is essential that a representative sampling of the total number of graduates be used. There may be variances in job requirements and in the use of graduates, depending upon the function of the organization to which the graduate is assigned, the geographical location, etc. The sample should allow for these possible sources of variation.

Field evaluation visits are made by personnel who are normally engaged in instructional activities. They are sent to visit a representative sample of graduates approximately 3 to 6 months after these graduates have been assigned to their jobs. The purpose of these visits is to obtain first-hand information concerning graduate assignment, utilization, and proficiency on the job, and to validate information gained from questionnaires. Data is gathered through observation and interviews with both the graduates and with their immediate supervisors. The main purpose is to find out how proficient the graduates are. But the evaluator also wants to know how the graduates' skills are being used and how well they are progressing through on-the-job training. A list of supplemental questions, similar to those used in a mailed questionnaire, should be used as a guide when an interview is conducted with a graduate's supervisor. Notes should be taken on the answers to significant questions, in addition to specific or implied comments.

Summary

To ensure an effectively operating instructional system, it is not only necessary to develop validated, job-referenced instruction, but there must also be planning and preparation for the implementation and maintenance of the instructional system. This will require training for instructors in their new roles, and orientation for supervisors and managers in the supportive actions which they must provide. When the system becomes operational, it is necessary to conduct both internal and field evaluations. The evidence collected during these evaluations must be examined to determine if the graduates are, in fact, capable of satisfying job-performance requirements. This information will provide the feedback to the instructional system personnel.

Now that the description of the ISD process has been presented, it may aid the reader's understanding if a few of the more significant ways in which this process differs from the more traditional ways of designing instruction are pointed out:

-- The systems approach defines a process which **focuses upon the job** that is ultimately to be performed and **upon the individual** who is to learn to perform that job. Traditional approaches, by contrast, focus upon **conventional subject-matter blocks** that tend to be more of the "school catalog" variety and are, generally, only approximately pertinent to what the student will be doing later (Russel E. Schulz, et. al., "On-Line Authority Aids for Instructional Design," TR 387, U.S. Army Research Institute, July 1979, pp. 1 and 2).

-- ISD calls for analyzing and documenting job performance requirements and for developing explicit training objectives. It calls for these objectives to be stated in terms of expected performance (behavior), conditions under which that behavior is to be performed, and the standards to which it is to be performed. Training or objectives not necessary for job performance are eliminated. Conventional instruction tries to do the same thing, but in a less systematic, less scientific way--with the result that training objectives are often fuzzy and ambiguous. Also, objectives and training are often included which are not necessary for job performance.

-- With ISD, accomplishment of the behaviorally-stated objectives is the goal. Where practical, time is the variable and the student progresses as s/he demonstrates mastery of the objectives. With conventional instruction, time is usually fixed. All students get the same quantity of instruction whether or not they need it. And student achievement is the variable.

-- In ISD, performance tests are developed along with the objectives, and then the lesson content is developed. The tests then serve as a check on the instruction. In conventional instruction, lesson content is selected and written and then tests are written which are based upon this lesson content. This may result in students who do well on the tests but perform poorly on the job.

-- With ISD, student performance is criterion referenced. The student is measured against specific standards--how well s/he accomplishes the objectives. In conventional instruction, norm-referenced measurement is usually employed. That is, students are measured in relation to how other students perform.

-- Under the ISD process, instruction is validated on the target population prior to implementation. With conventional instruction, this is rarely done. Instruction is implemented without validation, and modification awaits feedback from graduate evaluation. Often this process takes several years.

HOW USAF IS APPLYING THE ISD PROCESS

The Scope of USAF Training

The Air Training Command (ATC) is the Air Force command which provides most of the formal training for the Air Force. The courses ATC provides cover a wide range of subject matter, including:

-- Basic training for officers and enlisted persons.

-- Initial-skills training (everyone in the Air Force is a specialist). These courses range from heavily performance-oriented equipment maintenance and operator courses, to courses that are mostly cognitive. They relate to technical training, health, education, and flight training.

-- Advanced training to upgrade skills and knowledge.

-- Lateral training to extend skills and knowledge to related equipment.

-- Professional military education (courses in management, leadership, etc.).

-- University-level educational programs.

-- Extension Courses.

ATC also conducts on-the-job training for its own personnel. The other commands become involved in training, too. The Air Force Regulation on Instructional System Development has directed, as Air Force Policy, that the ISD processes will be used in developing all of these types of training and educational courses.

The Air Force provides support to those involved with the application of ISD in a variety of forms. **Air Force Manual AFM 50-2, Instructional System Development,** presents an instructional development model for developing and conducting efficient and cost-effective instructional systems. This is the model that was summarized earlier in this chapter. **AFM 50-2** also includes a discussion of some of the special problems which are involved in trying to apply the ISD process to the design and evaluation of instruction for technical training, flight training, training in support of new weapon/support systems, knowledge and attitudes, and on-the-job training.

Air Force Pamphlet AFP 50-58, Handbook for Designers of Instructional Systems, provides guidance in applying the process described in **AFM 50-2,** and some of the related instructional technology. It describes the entire development process in detail. It is a handbook which provides suggested procedures and techniques. The reader must decide which suggestions will be applicable and helpful to her/his situation. Volume I provides an overview of the use of the handbook and of the process of instructional system development, a version of the ISD model that is expanded to the third level of detail, an explanation of the terms important to ISD personnel, and an example of the application of the ISD process in a case-history format. Volumes II through V provide guidance on how to analyze system requirements; define education/training requirements; develop objectives and tests; plan, develop and validate instruction; and conduct and evaluate instruction. The sixth volume does not describe a part of the ISD process; rather, it presents the basic concepts of programmed instruction and describes a variety of programming techniques. Volume VI is a part of the handbook because programmed instruction is a student-centered method of instruction that is compatible with a systems approach.

An instructional-technology film series has been developed. It includes an introductory film on the ISD process, and films on system analysis, on the development and use of occupational survey data, on criterial objectives, on criterion-referenced testing, on individualized instruction, on the changing role of the instructor, on selecting instructional media, on performance testing, and on validation and evaluation. The films in the series are intended to introduce concepts and to favorably influence attitudes. They are not designed to develop the in-depth knowledge and skills needed to apply the concepts.

The Air Force also publishes a periodic newsletter, "Development of Instructional Technology" ("DO IT"). Its purpose is to promote an exchange of information on the latest developments in training technology and to communicate the general state of the art in training technology to the field at large. It is a means for sharing ideas and for promoting communication between those who are dealing with a common problem.

Information alone usually is not sufficient; training is also needed. So, the Air Force provides three courses:

1. The "Instructional System Designer" course is a 4-week resident course designed for the individuals who design courses for training programs. This course trains an individual to perform all of the ISD activities, from task analysis through the design and validation of instructional materials.

2. "Development and Management of Instructional Systems" is a 5-day course for training the managers and supervisors of the personnel who develop instructional systems.

3. "Staff Orientation-Instructional System Development" is a 1-day course for staff-level managers who support the ISD effort but are not directly responsible for the resulting training.

Understanding and support by high-level management is critical to the successful application of the ISD process. For these people, the Air Training Command prepared an "ISD Executive Summary for Commanders and Managers." Some of the other major commands have developed similar pamphlets. The purpose of these pamphlets is to acquaint the commanders and managers with the essence of the ISD process, to indicate how it can help them, and to explain what they must do (and **not** do) to aid the process.

Finally, Air Training Command maintains an Advisory Service on instructional systems and instructional technology for the Air Force. The mission of the Advisory Service is to keep those who need to know aware of the state-of-the-art in instructional technology and to provide advice regarding the application of the instructional-system-development process. This includes the identification of relevant materials and of similar systems that already exist.

Extent of Application

An Air Force regulation directs the use of the ISD process when new instructional systems are developed, and when major changes are made in existing educational and training programs. In the Air Training Command, the ISD process has been applied to the design of:

- Some of the professional military education courses.
- Training for flying personnel.
- Maintenance training for new weapon/support systems, such as the E-34 aircraft and the F-16 aircraft.
- More than 760 technical-training courses.

Other major commands are also applying ISD. Most of their efforts have involved operational training for flying personnel.

Benefits Acquired

Where the ISD process has been conscientiously applied, the results have been:

- More effective use of instructional time.
- Generally, reduced instructional time (sometimes, there has been a need to **increase** instructional time.)
- Identification and elimination of unneeded instruction.
- Training which better meets the needs of the operating orgainzations.
- Provision of a better basis for selecting and designing simulators and trainers. (Some simulators and trainers, especially those used for training flying personnel, are very expensive, so, if such training devices are ineffective or unneeded, they can be very costly blunders.)

Success Stories

By 1978, the ISD process had been applied to 760 resident technical-training courses taught by the Air Training Command (174 of these were shortened and 56 were lengthened). The net result was a savings of 227 instructional weeks. (Not all of this savings was the result of applying ISD; part of it came from a change in training philosophy which caused a reduction in the amount of theory taught in some apprentice-level maintenance courses.)

The Aircraft Electrical Repairman Course trains airmen in the skills and knowledge required to maintain electrical systems on all types of aircraft. When this course was taught as a conventional, group-paced course, the course length was 80 days. When it was redesigned as a self-paced instructional system, the average instructional time required by the first 490 students was only 69 days. More important than the savings in time is the fact that, in the self-paced version of the course, each student achieves each criterion objective. By contrast, the group-paced, conventional instruction often resulted in only a partial achievement of the objectives by most of the students.

The Maintenance-Analysis Technician Course is an advance course in inferential statistics for preparing senior noncommissioned officers and their civilian counterparts to analyze maintenance data. When it was redesigned as an instructional system, it became a totally self-paced course in which the student receives instruction from video tapes and programmed workbooks, and uses electronic calculators to perform the analytical functions. In this arrangement, the student can spend as many hours a day and as many days a week in study as s/he wishes. The average student takes 21 days to complete what had been a 35-day course.

The F-4 is a fighter aircraft that has a 2-man crew consisting of a pilot and a weapons-system operator. When the course to train this team was systemized, the analysis of mission requirements (steps 1 and 2) led to the deletion of 10 training days and 14 flying hours for each crew member. This resulted in an annual savings of over $7.5 million.

One of the major commands required that annual refresher training be given to their aircraft-maintenance personnel on how to treat and remove aircraft corrosion. They assigned their ISD team to apply ISD to this training. The documentation the team developed (steps 1 and 2) showed that this training was not needed, because when the maintenance personnel spotted corrosion, they had to call in a Corrosion Control Specialist to treat it. By eliminating this training for the many personnel who did not need it, the Command saved about 30,000 student man-hours per year.

Problem Areas

To provide a balanced picture, it must be pointed out that there have been - and are - some problems in the Air Force's efforts to convert to the ISD process. It may be instructive to briefly examine some of them.

Given a problem involving the production output of his people, a manager sometimes prejudges the solution to be training, and directs the establishment of a course. (Earlier, we described how the manager should have handled this situation.)

A manager sometimes imposes unrealistic suspenses for completion of events in the instructional development of a course, or abruptly changes the planned completion date. The manager should require the preparation of an ISD plan with a time-phasing chart, and a rationale for the amount of time proposed. The development of an instructional system is a comparatively slow process, though there are trade-off options in the development process which can make a substantial difference in the development time in return for sacrificing some quality. Imposing a short suspense may seem like good management, but if it is unrealisitic and forces the developer(s) to by-pass essential parts of the process, it will be counterproductive.

More often than they should be, some parts of the ISD process are by-passed - usually because the developer feels pressed for time. These include:

- Use of the survey test.
- Validating instructional materials and instructional aids.
- Field evaluation of graduates.

When the survey test is not used, the instructional system developer is deprived of information which could have important consequences for the design of instruction. When validation is bypassed, the effectiveness of instruction cannot be determined until evaluation takes place, and that is too late for the students involved. Without field evaluation, the developers do not know how well their training equipped the graduates to do their jobs.

Too often there is a lack of documentation. Not only does this make the ISD effort suspect, it also lessens the potential value of the iterative part of the process.

Because multiple-choice tests are easier to administer and take less time than do performance tests, sometimes they are used when they should not be. The test item should measure the behavior the instruction is to shape. If it doesn't the testing effort is wasted. For example, if the objective is for the student to be able to parallel-park a car, multiple-choice questions cannot determine whether or not the student has met the objective.

Experience has shown that when "experts" apply the ISD process, they get very good results. But it is hard for the Air Force to get ISD experts in the quantity needed. This is so because most military personnel are rotated to new assignments every 3 to 4 years; and because the bulk of the ISD effort has to be borne by classroom instructors, who are subject-matter specialists, but who have had minimal training and experience in ISD. The Air Force does have a career field for Instructional System Specialist/Technician. However, the use of these specialists is quite limited, because for many organizations the choice is either an instructional systems developer who knows little about the subject matter, or a subject-matter specialist who has a limited knowledge of ISD. In most cases, Air Force training organizations seem to prefer to work with the subject-matter specialists and teach them what they need to know about ISD in order to perform their functions. In some cases an ISD team is formed, usually with a mix of subject-matter specialists and instructional systems designers.[6] This is probably the best solution to the problem. But for many organizations the limited manpower which is authorized will not permit the luxury of establishing an ISD team. Another possible solution to the problem is to simplify the process by devising better authoring aids and decision-tables.

PROSPECTS FOR THE FUTURE

The period of transition to the ISD process in the Air Force has been a difficult one for several reasons. Despite all this, the process has been demonstrated to be effective in a wide variety of situations.

There remain many obstacles to achieving the goal of meaningful, across-the-board application of the ISD process. Some of the obstacles will be easier to overcome than others. But the economic pressures are strong and the present leadership of the Air Force is determined; and at least as long as these two motivators are present, there is sure to be a continued growth in the applications of ISD - growth in the number of applications and growth in the quality of the applications.

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[6] In the Air Training Command, a different type of "team" concept is used. Because the mission of this large organization is training, the ISD function is integrated into the command structure. Therefore the Occupational Measurement Center gathers the job-performance requirements for most of the Air Force specialty areas. The functional managers in the Headquarters define the major constraints. The Plans and Requirements Division at each Technical Training Center determines the training requirements. The Training Branches have specialists who define the objectives, develop the criterion tests, select the instructional methods and media, and prepare the plan of instruction (syllabus). The instructors, who are the subject-matter specialists, develop and validate the instructional materials. And the Evaluation Division evaluates the performance of the graduates.

C. INDUSTRY

Chapter 39

Industry and Instructional Development

Clint Wallington

How does ID as performed within business and industry differ from ID as performed within formal educational institutions? How do the outcomes of ID differ in the two settings? What are the strengths and weaknesses of ID in business and industry which result from these differences? What is the future of ID in business and industry?

INSTRUCTIONAL DEVELOPMENT IN BUSINESS AND INDUSTRY? WHAT'S THAT?

The very title of this chapter illustrates one of the key problems in assessing the state-of-the-art of instructional development in the "non-education" world. Instructional development--or something very much akin to it--is **definitely** occurring in the business/industry sector. But, even though there is instructional development activity, the term "instructional development" is seldom used. Instead, the operational words are "training and development." Hence, any report, this one included, must concentrate more upon what is **happening** than upon what words appear in the literature. Even the writing of this chapter poses some special problems--whether to couch it in the terms that instructional developers use and feel comfortable with or to use the words used in business and industry to describe the same activities.

To clarify the issue, some limits to the meanings of the terms instructional development and training and development need to be set. In its glossary, the Association for Educational Communications and Technology (AECT)--one of the chief proponents of the term, instructional development--defines it as "a systematic approach to the design, production, evaluation, and utilization of complete systems of instruction, including all appropriate components and a management pattern for using them." The definition then goes on to differentiate instructional development, which deals with systems of instruction, from instructional **product** development, which "is concerned only with isolated products," and from instructional **design,** which is only one phase of instructional development. (Presumably, one could use instructional design for instructional product development.)

The American Society for Training and Development (ASTD) has just completed an extensive competency study in which training and development is defined with a focus of "identifying, assessing, and--through planned learning--helping develop the key competencies (knowledge, skill, and attitudes) which enable individuals to perform current or future jobs." Even though the AECT and the ASTD studies differ in a few details, they are essentially the same as far as the development process they are describing goes. The two most visible differences are that: first, the training and development definition **overtly** includes the initial step of determining the actual skills needed and second, the training and development definition relates training to "jobs." These minor differences do not change the common core of the two definitions but rather show the differences in the orientations of the two different sectors--business/industry and education--and in their terminologies. The question inevitably arises, "If the basic elements of the definitions are the same and the actual development processes are the same, why aren't training-and-development and instructional development identical--isn't the only difference **semantic**?

AND NEVER THE TWAIN SHALL MEET

It's more than simple semantics. The difference between the two areas of practice--education as opposed to business and industry--causes some subtle, but very real, differences between the practice of instructional development and of training-and-development. Consider the following.

The purposes of the two groups differ. In most educational organizations or institutions, the primary goal is a trained/educated person who will leave the institution and pursue other goals. In a non-educational organization, training is a means to improve performance to meet the organization's primary goal. This major difference in primary goals leads to a number of **virtually unavoidable** differences in actual practices, the rules governing those practices, and hence in the process of instructional/training development.

The **primary** output of most organizations (and the process for producing that output) is usually regulated in some way. In the case of education, that means a regulation of educational programs and the degrees offered. Thus, many facets of the process are monitored--number of class meetings and instructor credentials, for example. In business and industry, it is more likely that legislation and governmental regulations will deal with the output and ignore the training of the organization's employees as long as the training does not violate health and labor codes. Think of the differences this makes in things like procedures for changing courses and curriculum **and getting the necessary approvals,** having programs reviewed, hiring instructors, and scheduling classes.

The relationship of the learner to the organization differs radically between the two areas. In formal education, the learner:

-- has no thought of continuing the relationship with the organization after the training period,

-- sees a definite end to the training after a specific goal is reached,

-- undertakes generalized training for a general skill, a family of jobs, or a career,

-- is not compensated during the training period and may actually pay for the training.

In contrast, the learner in business and industry in an in-house training program usually:

-- envisions a continuing relationship with the organization,

-- views training as an ongoing process during the period of employment,

-- is trained for a specific job or for a skill directly related to the work setting, and will have the opportunity to practice that skill on the job soon after the training period,

-- not only does not pay for the training but is actually compensated for the training.

These qualitative differences have immediate implications for instruction and instructional development. For example, in formal education a course is structured around "credit hours" or a set number of "contact hours." There is no incentive (and there may be penalties) for teaching the skill in less than the fixed number of hours. Or, because the student in education is not paid for her/his time, out-of-class assignments are normal, if not required. The situation changes when the learner is in class as part of her/his job. Yet another example is the specificity of the training. The employer who views training as an ongoing process on a "need to" basis needs only to train for specific job-related skills. An educational institution, unsure of the exact job each graduate will hold, opts for more general skills and a heavier dose of theory.

Finally, because the purposes of the two areas are different and the practices are different, so are the organizational structures and the reward systems different. This also makes for differing parameters for the two fields even though the general process is the same for both. For example, the instructional developer in the education sector is likely to seek (or at least covet) tenure, which is generally based upon scholarly research rather than upon successful instructional development efforts. The instructional developer in business and industry will look for promotion (and some raises in salary), which are more likely to be given as a result of successful projects. These differences **must** be taken into consideration as we look at the state-of-the-art in instructional development in business and industry.

SEVEN MAJOR OBSERVATIONS ON THE STATE OF THE BUSINESS/INDUSTRY INSTRUCTIONAL DEVELOPMENT ART

After all that preamble, the general observation on the state of the art is, "It all depends." It depends chiefly upon the areas under examination, the measures chosen for use in evaluating the state-of-the-art, and the methods used to gather and sift data. With some oversimplification, however, it's probably safe to make the following observations, remembering that the art describes what **is** and not what ought to be (the ideal)--and also remembering that there will be exceptions to the following generalities.

First, no single organization embodies total state-of-the-art in instructional development. As a corollary, most organizations vary widely in their approach to instructional development. It is far easier to locate training or instructional development units within an educational setting than it is in businesses or industrial organizations. In addition, the units in different educational organizations are far more likely to be similar to each other than are instructional development units in different companies--or perhaps within the same company. In a large company, it is common for each division or major operating group to have its own training--and instructional development--unit. This diversity stems from the fact that the regulation of education forces a more or less similar internal structure and the fact that training in business and industry has no inherent "home." Sometimes, training is part of marketing; sometimes, part of production; sometimes, a corporate unit; sometimes, part of personnel--or it can as readily be part of "other" or "all of the above."

Second--although they may be exceptions to the rule, there are some truly high quality, very sophisticated training programs created through equally sophisticated instructional development efforts. Some clear evidence of this can be found by examining the winners of the national instructional development awards of the National Society for Performance in Instruction (NSPI). In many instances, not only has an "instructional development system" been installed but a system to train people to work in the training or instructional development system has been developed and installed. The use of the instructional development system and the requisite training is often **mandated** within the organization. The advantage of this single-system approach is that both the process within and the result of the instructional development system remain relatively consistent, no matter who is doing the instructional development work.

A singular example of this approach is Xerox' adoption of Criterion Referenced Instruction (CRI) for training technical service representatives. Xerox' service education group uses CRI both to develop courses for its copier service personnel and also to train employees in how to develop instruction using CRI. Functional documentation personnel (the people who write the manuals) are also often trained in CRI so that the service manuals more closely match the coursework and field experience. The single-system approach with a number of employees trained in the approach allows for rapid assembly of instructional development teams for specific projects, yet tends to maintain a consistent output across projects--a mark of state-of-the-art indeed. In support of the first observation, it is worth noting that CRI is **not** a common practice throughout the corporation but **is** also in use at another copier manufacturer--again, primarily for training copier service personnel.

Third, instructional development in business and industry is still tightly linked to the concept of the subject-matter expert as course developer and instructor--although this is changing. Because most companies are product oriented, most first think of finding a content specialist when there is a training need. This is especially true in smaller companies which cannot afford the luxury of a broad-based training department or in companies where there is no great need for training, and instruction can be created and delivered on an **ad hoc** basis. In larger organizations or in organizations that have recognized the need for consistency in training, instructional development has made significant inroads even though the organization may train its content-matter experts to be instructional developers (as in the foregoing example). It should also be noted that with more graduates of "instructional development" programs (under any name) entering business and industry, there will be a concomitant increase in the number of trainers who are primarily instructional developers (rather than content experts) simply because this wave of instructional developers is not adverse to the idea of instructional development as a separate training function, and they will continue to promulgate the concept.

Fourth, there must be some sort of critical mass or specific training problem before a business or an industrial organization turns to and embraces instructional development. As mentioned earlier, the primary goal of business and industry is to offer a product or service to a client rather than to "improve" its training program. The cause must precede the effect. This cause can take any number of forms--poor training which affects the quality of products, increased numbers of people to be trained (or retrained), training needs spread over a large geographic area, employee turnover. At some point, an organization (at least a successful one) will identify its training needs and begin to accept the fact that the subject-matter-expert-temporarily-serving-as-trainer cannot meet a widespread training need. At this point, instructional development--given a product champion and some early successes--can flourish.

Fifth--and related to the preceding, instructional development seems to be more prominent in the technical skills area--as opposed to interpersonal skills, sales skills, and personal growth skills. One reason for singling out technical skills training for instructional development is that the procedures in technical skills are often quite specific. "Follow this procedure and you get this result." Technical skills are often widespread in an organization and there are often more employees in need of technical training than there are those who need training for upper management. It is probably significant that the majority of NSPI's instructional development and training awards go to technical skills training projects and that ASTD has a very active division for those interested in technical skills training.

Sixth, business and industry rely far more heavily upon the use of off-the-shelf courses and materials than does education. The same is true about the use of outside instructional development (and training) consultants. Once an organization accepts the fact that there is more to training than the occasional **ad hoc** safety lecture, new employee orientation, or on-the-job training, the training department is usually charged with getting the job done rather than doing the actual training. If the trainer or instructional developer can make a reasonable case that the use of resources from outside the company is cost-effective, there are few constraints about either using existing materials or bringing in instructional developers to create the necessary instruction. This means a shift in emphasis from platform instruction to the management of instruction, often with appropriate rewards--a situation not common in education, where its absence often restricts the growth of instructional devlopment.

Seventh, the emphasis of instructional development is upon producing successful instruction rather than upon studying the process or finding a better way of delivering instruction--**unless** the new mode of instruction/training makes the process more effective or more cost-effective. In other words, the state-of-the-art is getting the job done, **not** developing new models of instructional development. For the instructional developer from an educational setting who is entering the business/industry sector, this means solving the instructional problems at hand expediently and worrying far more about applications than about theory. **Verbum sapientibus sufficit.**

THE BOTTOM LINE

The bottom line--a common term in business and industry, but commonly misused by just about everyone--is that the state-of-the-art of instructional development in business and industry is characterized by:

-- no clear, practical way to quantitatively assess the state-of-the-art;

-- an overwhelming emphasis upon the practical, operational, get-it-done, to-hell-with-elegance-but-don't-look-sloppy, results-oriented side of instructional development;

-- a strongly pragmatic and eclectic approach to instructional development--the instructional development system and/or theory chosen is the one that is most cost-effective;

-- a very uneven level of sophistication of instructional development, with a wide range of variations possible (and even likely) **within** the same organization;

-- the conduct of little formative evaluation (unless something doesn't work) and no summative evaluation (unless the system manager needs it for cost justification);

-- a strong dependence upon outside consultants, either individuals or consulting firms;

-- a value system with related practices and terminology different from the education sector;

-- an almost total lack of communication between the business/industry and formal education sectors in instructional development (although this is breaking down--more about that in a moment);

-- less free sharing of information and technique in the business/industry sector than in the education sector (only natural, if you think about it).

Instructional development is alive and growing in business and industry although those in the educational sector might be hard-pressed to locate, identify, classify, and measure it. But there's no doubt--it's there and flourishing. It will continue to grow, especially as companies place a greater emphasis upon training and development and realize the long-term benefits of instructional development. Moreover, the gap between the two sectors will probably continue to diminish, although they can never totally merge because of their different goals and value systems.

The foregoing observations were completed **before** the American Society for Training and Development (ASTD) released its competency study in the area of training and development (June, 1983). The competency study focuses upon the area of training and development as part of a larger whole--human resource development. The ASTD competency study looks past job descriptions, and for training and development identifies thirty-one general "competencies" which are clustered into fifteen "roles." (Each competency supports more than one role; each role has at least four competencies--thus thirty-one can be spread among fifteen.) The study offers an information base and structure which allows for any number of uses--training, job descriptions, self-assessment, job performance, certification. The irony is that the Association for Educational Communications and Technology (AECT) developed much the same information base about a decade earlier in its federally-funded research study, Jobs in Instructional Media. This study also eschewed job titles, using ten functions to classify activities. (You can conceptually substitute AECT's "functions and activities" for ASTD's "roles and competencies" even though they're not precisely the same.) AECT used its study and another study to produce a rather extensive glossary of definitions and terminology which, as ASTD did, focussed upon instructional development but looked at the larger context. The Ontario (Canada) Society for Training and Development's (OSTD) Competency Analysis for Trainers was published in 1979, chronologically between the AECT and ASTD studies. Another competency "study," this one used four functions (more like the ASTD roles than the AECT functions) and twelve "competency areas," each of which have further competency subdivisions. OSTD released its material as a personal planning guide for use in practitioner self-assessment. Although each would probably Although each would probably disclaim the notion, ASTD's "roles" and "areas" parallel AECT's "functions"--again indicating a tremendous overlap in the **process** of instructional development in the two sectors but emphasizing the dearth of communication between the two sectors. OSTD's materials are oriented toward the business/industry sector. ASTD gives no indication in its materials that it knows about the AECT work, but pieces of the study have a slightly similar feel--probably as a result of individuals who have been involved in both efforts. OSTD acknowledges an ASTD source (among others) but none in AECT. There are undoubtedly some cogent rationales for the separate efforts. But these anecdotes serve to point up the differences between the two sectors--even though practitioners in both fields may be using a similar process.

What will happen as a result of all this involvement of professional associations in the area of instructional development remains somewhat of a mystery. One can only look at some occurrences and make conjectures.

Item: AECT's Division of Instructional Development is, as of this writing, developing instruments to "certify" instructional developers--a concept which the entrepreneurial sector (those "outside" consultants) in ASTD may well find distasteful.

Item: OSTD has already disseminated their study internationally to other training associations and plans further implementation.

Item: ASTD's dissemination plans for its study encompass a variety of uses with no single, clear-cut goal. Other sectors within the Society, particularly some local chapters, have been involved in the development and may play a key role in the dissemination and utilization efforts.

Item: There is some informal movement within ASTD's Media Division to increase the emphasis of instructional development rather than media production. There will probably be some resistance to this notion and it may never see the light of day--still, up pops instructional development.

Item: The National Society for Performance and Instruction (NSPI) is rapidly becoming a haven for instructional developers from both sectors, especially those who have come to business and industry with degrees in instructional development--as opposed to traditional trainers. With its emphasis upon performance, it attracts business/industry developers who have a practical orientation; yet with a strong contingent of academics in its ranks, it can still attract those from the education sectors.

All of which leads to a different bottom line about the professional growth of the field of instructional development, when considered **en bloc**, and that is: successful, cost-effective accomplishments in business/industry will drive the growth of the "practice" of instructional development, while the association which does the best job of marketing instructional development (to practitioners and to users) and thus attracting members will affect the growth of the "field" of instructional development--and the state of the art. As mentioned earlier, it really does all depend.

D. PUBLIC SCHOOLS

Chapter 40

ID and the LMS: Past, Present, Future

Philip Michael Turner

Instructional Development, sometimes under other names, has been widely accepted in industry, the military, health fields and higher education. Little is heard about it in the public schools. Why is this so, and what should be done about it?

The literature on school librarianship has evidenced an evolution in the role of the library media specialist (LMS) during the past several decades. Each succeeding standard increased the depth and breadth of this role, culminating in the 1975 standards, *Media Programs: District and School* (American Library Association, 1975) in which the LMS is encouraged to abandon the concept of passive service and to assume an active role in curriculum development.

The overwhelming majority of textbooks and other monographs that target the LMS contain references to the involvement of the LMS in the teaching and/or curricular development processes. Works by Hug (1975) and Chisholm and Ely (1979) are totally devoted to this concept.

There has been a steady appearance over the past two decades of articles espousing the virtues of including instructional design (ID), instructional development, curriculum involvement, teaching, and other related activities in the role of the LMS, with few negative or cautionary voices raised. A Delphi study by Jetter (1972) and a study by Pearson (1974) concluded that adding the practice of ID to the role of the LMS would be the next major innovation in the future of this field. In summary, at least for the past decade, the idea of a new role for the LMS, one that includes assisting in the design of instruction, has achieved very wide dissemination.

Despite the presence of an awareness of the new role of ID, the actual acceptance and adoption of the role seems to be much less widespread. Varying attitudes have been documented by a substantial number of studies carried out regarding role-perception and ID activities involving LMS's, teachers, and principals.

With respect to principal's and teacher's perceptions of the LMS as an instructional designer, studies by Lacock (1971), Cantor (1975), Pfister and Alexander (1976), Johnson (1977), and Willis (1979) reported predominantly negative attitudes toward this concept.

Results of studies investigating the attitude of the LMS toward taking on this role are also mixed. Kerr (1977), Loertscher (1973), and Johnson (1977) published results indicating a lack of acceptance by the LMS, while Leeper (1975), Larsen (1971), Cantor (1975), and Turner and Martin (1979a) found a more favorable response toward the performance of ID by the library media specialists in their populations.

Substantially fewer studies have been carried out regarding the actual performance of ID by the LMS. Willis (1971), Loertscher (1973), and Pfister and Alexander (1976) concluded that large numbers of library/media specialists were not performing ID with their teachers regularly. While Turner and Martin (1979b) found a similar lack of performance of higher-level ID, the LMS in their population reported widespread performance of "lower-level" ID.

Several studies have been performed to determine factors which could be related to the performance of ID by the LMS. Personality characteristics identified were role-taking ability, linked positively with attitude toward ID by Kerr (1977); extroversion, linked positively with involvement in curriculum work by Schultzetenberge (1970), negatively with allocation of responsibility to the LMS by Daniel (1974), and postively with amount of material circulated (Madaus, 1974). Other factors identified include LMS's undergraduate major (Schulzetenberge, 1970), teaching structure (Madaus, 1974), budget and principal's attitude (Larsen, 1971), and attitude of principal and of LMS (Leeper, 1975).

A careful reading of the previously-cited studies reveals a few consistent findings, with many that are either non-significant or inconsistent. None of the studies purported to isolate ID from other related activities or to generate a theoretical basis for the delineation of ID activities.

Turner and Martin (1979b) attempted to address this problem by identifying 28 activities which represented the scope of ID at the K-12 level, and also a continuum of complexity of tasks. Tasks were drawn from the Task Analysis Survey Instrument (American Library Association, 1969), from other literature, and from extensive correspondence with professionals in the field. The basis for the selection and inclusion of the activities was the definition of instructional development found in Educational Technology: A Definition and Glossary of Terms (Association for Educational Communications and Technology, 1977), which divides instructional development into six functions: Research-Theory, Design, Production, Evaluation-Selection, Logistics, and Utilization-Dissemination.

Construct validity of the instrument was investigated through the use of a factor analysis of the 28 activities. Six factors were found, four of which accounted for 91.3% of the variance and included 25 of the 28 activities. A study of the activities included within each factor permitted the assignment of factor-constructs of four of the six functions of instructional development as delineated in the AECT definition. The grouping of activities within the instrument, therefore, mirrored to a large extent the theoretical groupings proposed in the AECT definition.

Variables which had been identified in previous studies as possibly related to each other were utilized as independent variables. These included attitudes toward ID by the LMS and by the principal, self-competency ratings of the LMS, budget, planning time, type of assistance provided to the LMS, and the empathy trait of the LMS. Other variables were taken from investigations of the activities of teachers and principals.

The variables that were found to be related to the overall performance of instructional development were amount of planning time for teachers, budget, amount of production equipment available, number of professional journals read, self-reported competencies, empathy-trait score (see Turner, 1979a), principal's attitude toward the performance of ID by the LMS (see Turner, 1979b), and the attitude of the LMS; all of these related positively to reported performance. The number of student-helpers was the lone significant negative-correlated variable.

The independent variables were entered into a step-wide multiple regression calculation with factor-scores as dependent variables. As can be seen in Tables 40-1 - 40-4, the competency variables were consistently the most important variables, mentioned first in all four of the equations. The principal's attitude was loaded heavily both on the Design and the Evaluation-Selection factors.

Table 40-1. Multiple Regression Summary Table for Factor 1 (Evaluation-Selection).

Independent Variables	Multiple R	R Square	RSQ Change	Simple R
Total Competency	.5176	.2697	.2697	.5167
Number of hours assigned to media center	.5665	.3209	.0530	.1792
Number of design courses	.6194	.3836	.0627	-.0268
Principal's attitude	.6627	.4392	.0555	.2972
Number of education courses	.6861	.4707	.0314	.1352

Table 40-2. Multiple Regression Table for Factor 2 (Design).

Independent Variables	Multiple R	R Square	RSQ Change	Simple R
Total Competency	.6274	.3936	.3936	.6274
Principal's attitude	.6884	.4739	.0803	.4190
Total budget	.7222	.5216	.0476	.3024
Amount of time not assigned supervisory duties	.7482	.5599	.0383	.1664
Competency in design	.7757	.6081	.0419	.5290

Table 40-3. Multiple Regression Summary Table for Factor 3 (Production).

Independent Variables	Multiple R	R Square	RSQ Change	Simple R
Competency total	.4852	.2354	.2354	.4852
Parent volunteers	.5030	.3516	.1162	-.3052
Enrollment	.6274	.3937	.0420	-.0134
Amount of time not assigned supervisory tasks	.6447	.4157	.0219	.1709
Competency in traditional library skills	.6612	.4372	.0214	.3046
Competency in production	.6791	.4655	.0283	.3287

Table 40-4. Multiple Regression Summary Table for Factor 4 (Logistics).

Independent Variables	Multiple R	R Square	RSQ Change	Simple R
Competency in education	.4385	.1923	.1923	.4385
Number of production equipment items	.5734	.3288	.1365	.3781
Years of classroom experience	.6248	.3904	.0615	-.1504
Production budget	.6528	.4332	.0321	.3343
Student help	.6822	.4653	.0321	-.2449

Through an analysis of all of the studies, the profile of the LMS involved with teacher-clients in ID efforts emerges. This person possesses the requisite competencies; believes that ID should be included in daily activities; and appears to most of the teachers to share their values, beliefs, and experiences. In other words, a wide spectrum of ID is being performed at the K-12 level by the best-prepared library/media specialists at the best schools with the best principals. This excludes the majority of library/media specialists, who lack the preparation, the appropriate environmental factors, or the proper attitude for performing ID.

As competencies in ID seem to play an important role in the profile of the successful instructional designer, the preparation of library/media specialists seems worthy of investigation. Several studies of non-print media courses have been conducted, including Lieberman (1955), Totten and Mitchell (1973), and Prostano and Prostano (1979). None of these studies, however, addressed preparation specifically in terms of ID, nor did they mention this construct in their studies.

Stone and Turner (1980) investigated the preparation of the LMS at the Master's Degree level within 43 library schools in the Southeast. Information was collected concerning the location of instruction in 13 different ID competencies. The list of competencies examined was chosen from an analysis of frequently-cited models. Information was also collected concerning whether the competencies were required or were elective for this population.

Eighty-six percent of the institutions queried responded. Of those that responded, over half required either all of the competencies or none of the competencies. This finding leads to the conclusion that ID can be regarded as a single, atomistic, innovation in terms of its diffusion into library-school curricula in the Southeast.

The three competencies required most often were identification of terminal-performance objectives, identification of interim-performance objectives, and development of motivational activities. Since the first two are probably the most common of the "new" practices required of teachers, and the third is a standard topic in method courses, the fact that these three would be the most common ID competencies required in library-school curricula is not surprising.

The three competencies required least often were learner analysis, identification of learning-behaviors according to a prescribed taxonomy, and arrangement of objectives into a hierarchy. These are probably the most complex and theoretical activities of instructional designers, and it is not surprising that these competencies were not as widely evident in the preparation programs.

Further findings of this study included the establishment of a profile of the program that offered ID competencies in courses taught within the department. This description would include lack of accreditation by the American Library Association, the subsumption of the department within a school of education, with a high percentage of the students within the department pursuing certification as library/media specialists, as opposed to academic, public, or special-library careers. A further study included all accredited library schools in the United States (Turner, 1981) and has yielded similar findings.

The evidence presented thus far is a basis for the following conclusions:

1. ID as a significant part of the library/media specialist's role is solidly established by the literature of the field.
2. ID competencies are available in most LMS preparation programs and the requirement of the competencies has made a solid inroad into a substantial minority of these programs.
3. The LMS equipped with ID competencies and with philosophical and financial support is performing a wide range of ID tasks.

Based upon these conclusions, ID, as performed by the LMS, can be seen to be following a logical diffusion-pattern (see Figure 40-1) emanating from a solid literature base, into preparation programs, and finally, into the field.

What are actions that can be taken to continue or perhaps speed up the diffusion-process? The following are several possible actions:

1. Continue the trend of the last decade involving the dissemination, through the literature, of research results and theoretical writings to decision-makers in the LMS preparation-programs and to practitioners who read and utilize journal information.
2. Identify key works which reach large numbers of administrator-practitioners or trainees and make sure that the role of the LMS as instructional designer is included. The traditional role-descriptions found by Holzeberlein (1971) must be supplanted by a more up-to-date rendition.
3. Information pertaining to ID at the K-12 level should be disseminated through journals that reach teachers. Shoemaker (1978) found that of the 93 articles dealing with the LMS and the school curriculum, 83 were indexed in Library Literature and only 16 in Education Index.
4. The most significant action, upon which the remainder of this paper will focus, is a translation of the terminology inherent in the ID approach into terminology that is perceived to be relevant to LMS practitioners.

The question that must be asked is, "Is ID at the K-12 level sufficiently different from ID in industry, the military, and higher education to warrant a different aproach?" The answer is yes. The role of the LMS has already, in most cases,

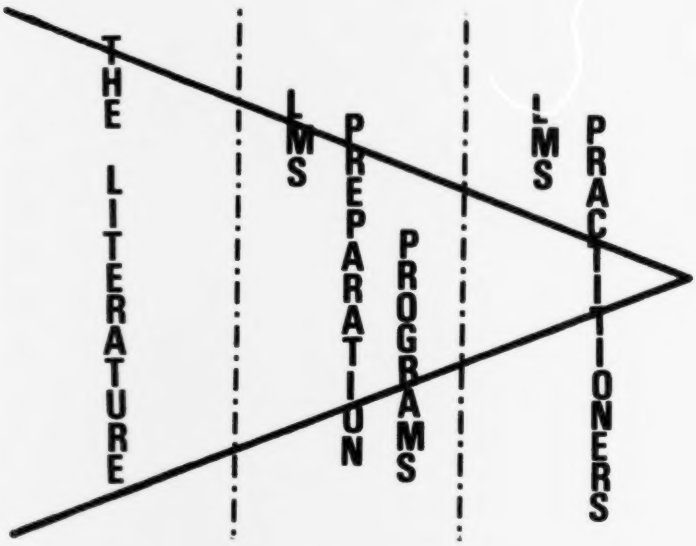

Figure 40-1. ID diffusion model.

been delineated and filled with traditional activities including typing catalog cards, teaching "library skills," preparing bibliographies, and conducting study halls. Unlike the complex instructional development projects found in the aforementioned areas, the LMS must make an effort to find time to conduct simple instructional design projects with teacher-clients while fulfilling other duties.

ID has traveled the dissemination route from the military, through higher education and industry, to arrive at the K-12 level with much of the terminology intact. The LMS about to begin an ID project is faced with a bewildering array of expectations and very few role-models.

The tension between the perception of the activities that are purported to be involved in ID and realities of the competencies possessed and the time available leads to a slow adoption rate. Even the LMS who possesses a positive attitude is often dissuaded from undertaking an ID project by her/his perception of the competencies and output required. At the conclusion of her report on the state of ID at the K-12 level, M. Grazier (1979) alludes to this problem:..."the extended yet flexible rule within the school now encourages the talented and discourages the meek."

The translation of standard ID into the vernacular of the practitioner would be expected to serve several purposes:

1. Help bridge the gap between many traditional fragmented activities and the interrelatedness inherent in the ID approach.
2. Help dissipate the belief that ID activities are totally foreign to "everyday" LMS activities.
3. Allay fears that ID requires competence beyond that of the "average" LMS.
4. Provide principals with evidence of a wide range of activities through which the LMS is directly involved in improving instruction.
5. Provide teachers with vastly increased avenues for interface with the LMS.
6. Provide the LMS with direct evidence of the role of the media program in meeting instructional objectives (see Turner and Counts, 1977).

The cornerstone of this elaboration on the ID model is the realization that the traditional model of ID (see Figure 40-2) is presented to the LMS as an ideal, and while it is a system and is usually regarded as a program to be worked continuously through,

1. The LMS need not interface with the teaching at EVERY step, and
2. The LMS need not interface with a teacher at the ideal level at ANY step.

The sine qua non of an LMS who has undertaken an ID role is the acceptance philosophically of the value of ID, an understanding of the ideal model, a realization of where any action fits into the model and a commitment to moving up the levels of involvement to reach the most effective and efficient level.

Steps toward this translation can be found in

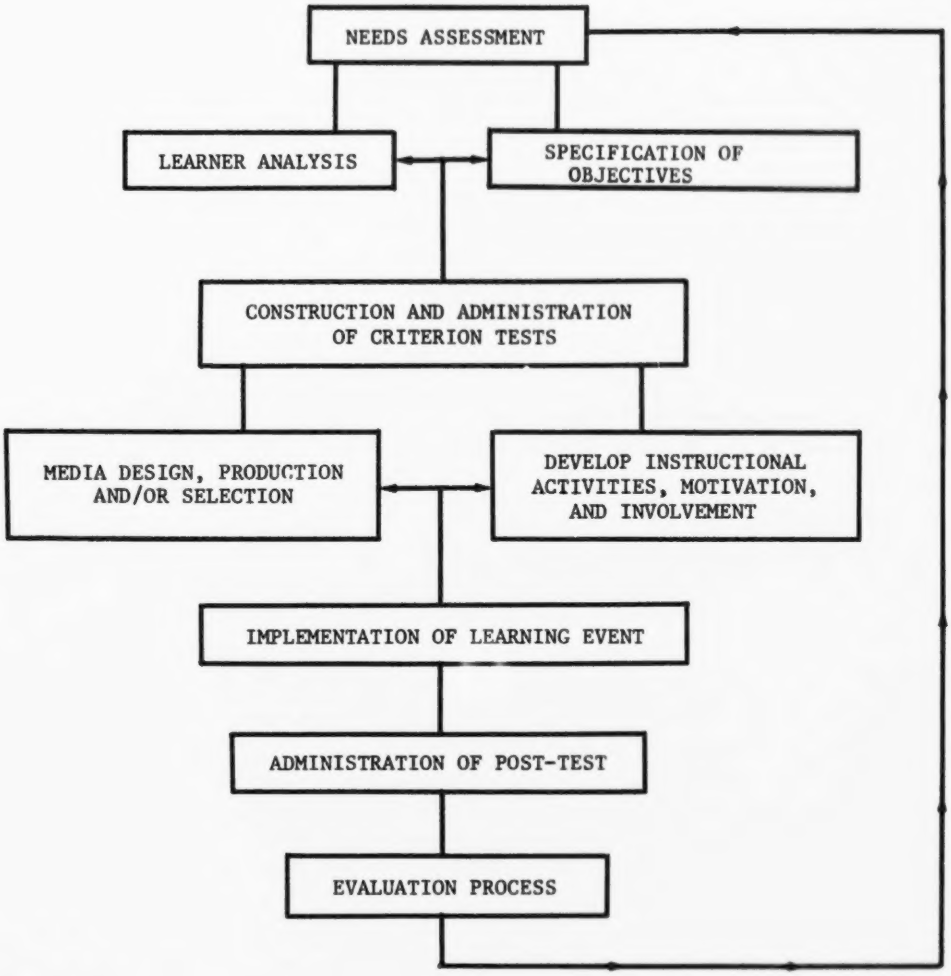
NEEDS ASSESSMENT
LEARNER ANALYSIS
SPECIFICATION OF OBJECTIVES
CONSTRUCTION AND ADMINISTRATION OF CRITERION TESTS
MEDIA DESIGN, PRODUCTION AND/OR SELECTION
DEVELOP INSTRUCTIONAL ACTIVITIES, MOTIVATION, AND INVOLVEMENT
IMPLEMENTATION OF LEARNING EVENT
ADMINISTRATION OF POST-TEST
EVALUATION PROCESS

Figure 40-2. Traditional ID model.

the recent literature Loertscher (1980) has evolved a taxonomy of involvement in ID which details 10 levels, ranging from no involvement through full-blown ID (see Figure 40-3). Other attempts to provide practical ID models for the LMS are Pitts (1980), Sullivan (1980), and Naumer and Thurman (1981).

While the Loertscher model is useful in showing the LMS a path toward heavy involvement in ID, it underplays the ID process itself. What seems to be neded, and where the literature seems to be pointing, is an "ideal" model of ID supplemented with levels of approximation within each step.

A possible formulation of levels within each step would involve creating levels corresponding to non-involvement, passive participation (Loertscher, Level 2), reaction (Loertscher, Levels 3-6), and education (Loertscher, Levels 7-10). Figure 40-4 illustrates these levels for the needs-assessment and performance-objective steps in the ideal ID model. The levels within each stage represent a natural continuum culminating in the ideal performance level.

In the best of all worlds, all teachers would possess the competencies to arrive at the learning resources center having performed the requisite tasks as suggested by the ideal ID model. The task of the LMS would be to assist them in locating, evaluating/selecting, and producing materials and in identifying/implementing appropriate learning activities. In the real world, however, many teachers require assistance throughout the entire process.

Figure 40-3. LMC taxonomy of involvement in instructional units (Loertscher).

1. NO INVOLVEMENT
   By-passing the LMC entirely.
2. SELF-HELP WAREHOUSE
   Facilities and materials are available for the self starter.
3. INDIVIDUAL REFERENCE ASSISTANCE
   Students or teachers can request information or specific materials with no advance notice.
4. CURSORY PLANNING
   Informal and brief planning with teachers for LMC involvement usually done in the hall or teacher's lounge (gathering ideas for activities, new materials to use, Have you seen ______?, Can I get you a film?).
5. PRE-PLANNED GATHERING
   Gathering of materials done in advance of class project upon teacher request.
6. EVANGELISTIC OUTREACH
   A concerted effort to promote the multi-media individualized instruction philosophy (often leads to #8-10). (In-Service workshops to promote AV production and/or use of AV materials, teaching various uses of equipment and materials, teaching possibilities of a medium to suit various ability and interest levels, promoting the usefulness of high interest/low reading level books, promoting use of interdisciplinary materials.)
7. SCHEDULED PLANNING IN THE SUPPORT ROLE
   Formal plan with a teacher to supply materials or activities in response to an already planned unit. No involvement in goals or evaluation of the unit.
8. INSTRUCTIONAL DESIGN - LEVEL I (Still some detachment from the outline in terms of grading.)
9. INSTRUCTIONAL DESIGN - LEVEL II
   Same as nine with LMC staff participating in grading and feeling an equal responsibility with the teacher for learning.

The role of the LMS is not to perform the task for the teacher, but to assist the teacher wherever appropriate in the ID process. Ideally, with each interaction, an educational process will take place, until eventually the role of the LMS will consist of the above-stated activities. As an experienced LMS knows, however, there is little danger of working oneself out of a position in the foreseeable future. The task of becoming THE learning specialist in the school is a large one, but the attendant satisfactions are larger. Hesitation will result in others accepting the challenge, as witnessed by the growth of in-school curriculum consultants. With a rededication to an ID process that is presented in an approachable manner, the promise which first appeared almost two decades ago will be realized.

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Figure 40-4. Levels of involvement for the needs assessment and performance objective steps of the Ideal ID model.

	(IDEAL) DETERMINES GOALS AND NEEDS THROUGH A FORMAL NEEDS ASSESSMENT PROCEDURE
EDUCATION	Participates as an active member in the goal-setting process at all stages Acquaints the teacher with the concept of instructional needs and the processes used in deriving sound goals and needs.
REACTION	Upon request, helps to brainstorm, and to establish in priority, goals and needs; suggests sources of goals; collects information; contacts possible source persons; and/or designs instruments
PASSIVE PARTICIPATION	Maintains potential sources of goals, eg.: lists of resource persons from the school district, community, and local college or university; collections of past course syllabi; certification requirements; extant course materials; textbooks; and curriculum guides Not involved with teacher at this step
	(IDEAL) DERIVES TERMINAL AND ENABLING OBJECTIVES FROM GOAL STATEMENTS, IDENTIFIES AS TO TYPE OF LEARNING, AND ARRANGES IN A TEACHING HIERARCHY
EDUCATION	Participates regularly as a consultant in the derivation, identification, and the arrangement of performance objectives Acquaints teacher through workshops and consultation with the purpose and process of specifying and arranging performance objectives
REACTION	Upon request, assists in translating goals into objectives, deriving enabling objectives, classifying objectives, and/or arranging objectives into a teachable order
PASSIVE PARTICIPATION	Maintains a collection of previously formulated objectives on many topics Maintains a professional collection of works on performance objectives Not involved with teacher at this step

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VII. PERSONNEL

A large measure of the success or failure of instructional development will be due to the personnel involved in the process. How these people are selected, trained, and managed will determine what instructional development actually is, operationally. New processes will not be used if the developers are not properly trained and motivated to use them. But how should developers be fitted to the particular development tasks? What, if any, personality factors should be considered? What training should be given and how and to whom should it be given? How should personnel be managed within a development project? And how are these things presently being done in the real world?

These questions will be addressed in the following section. Not all aspects of this matter will be addressed here, however. There are two subsections, called "Preparation of Developers" and "Women." The first subsection consists of five chapters dealing with the selection, training and evaluation of candidate developers. The second subsection consists of a single chapter which considers the role of women as professionals in the field of instructional development.

Clearly these are topics of great importance to an understanding of current ID practice, since a profession is a kind of social community made up of people who share a common way of looking at things and a common set of procedures for dealing with them. Therefore, it is important to consider how people become members of that community and what barriers are placed in their way.

A. Preparation of Developers

41. Training Instructional Developers: A Review of Current Practices and Directions for the Future. Kenneth H. Silber.
42. Problems Associated with the Professional Preparation and Certification of Educational Technology Personnel. Marvin E. Duncan.
43. Training Instructional Developers at Florida State University. Walter Dick and Robert M. Morgan.
44. Professional Education in Instructional Development at Michigan State University. Kent L. Gustaffson and Charles F. Schuller.
45. Professional Certification: A Status Report. Barry Bratton.

B. Women

46. Women in Instructional Development: Patterns of Growth. Laurel Dickerson.

A. PREPARATION OF DEVELOPERS

Chapter 41

Training Instructional Developers: A Review of Current Practice and Directions for the Future

Kenneth H. Silber

Are we a profession, and if not, how can we become one? What criteria must we meet? And how can we best train (or select to be trained) members of that profession? What is the relationship between psychological theory and ID training programs? The following chapter addresses these questions and provides answers which are both thought-provoking and which provide grounds for further research.

INTRODUCTION

Ever since the pioneering article "Would You Believe an Instructional Developer?" (Faris, 1968) we have been struggling to prove to ourselves, and to those we work with, that instructional development is indeed a profession.

To do this, we must first know what the characteristics of a profession are. Finn (1953) gave this answer:

> A profession has, at least, these characteristics: (a) an intellectual technique, (b) an application of that technique to the practical affairs of man, (c) a period of long training necessary before entering into the profession, (d) an association of the members of the profession into a closely knit group with a high quality of communication among members, (e) a series of standards and a statement of ethics which is enforced, and (f) an organized body of intellectual theory constantly expanding by research. (Finn, 1953).

Four additional criteria were added by writers over the next 21 years:

(g) the ability to exercise its own leadership (Finn, 1960);
(h) professional concern for responsible use of its work (AECT, 1972);
(i) an established relationship with other professions (AECT, 1972);
(j) acknowledgement as a profession (Silber, 1974).

Based upon these criteria, is instructional development a profession? Silber (1977, 1980) evaluates ID in terms of each of these criteria, and concludes that, while ID is on its way to becoming a profession, it has not become one yet.

One of the major areas in which he believes ID has yet to mature--and the area that is relevant to this paper--is that of training instructional developers.

Training as a Problem for Instructional Development

In discussing the professional status of the entire audiovisual field in 1953, Finn concluded:

> The test of a high degree of

> professionalization of the audio visual field, however, breaks down completely against the third criterion--a long period of training for members of the profession. Most professions not only require this long period of training but are also **in substantial agreement as to the nature of this training...** The nature and content of professional education for audiovisual directors and other workers present many problems that must be solved.... Obviously, a graduate program that can provide the competencies generated by service and industrial experience coupled with a better theoretical background is required immediately. (Finn, 1953, boldface added)

Assessing the situation specifically for instructional development 24 years later, Silber (1977) found that "there is little agreement on what constitutes appropriate competencies, instructional strategies, and learning resources" for training instructional developers. Four years later, he found only four articles dealing with training instructional developers (Hendrix and Tiemann, 1971; AECT, 1974; Patridge and Tennyson, 1978-79; and DID, 1980). Gayeski (1981) received several listings of competencies required for trainers/HRD specialists, but did not discuss training implications of the competencies. If we add to this the five-article symposium on training instructional developers presented at the 1980 AERA Convention, and published in the Journal of Instructional Development (Vol. 4, No. 3, Spring 1981), we still find a paucity of literature dealing with training.

Summarizing the sad state of ID training, and proposing a direction for the ID field to take, Silber (1980) states:

> It **does not understand** the process of training instructional developers like it understands the processes of doing it. More importantly, **it does not know** that it is not training as well as it should be, and certainly has no idea **what is needed to improve itself....**the field of ID must undertake **systematic data-based analyses of (a) what makes a"good" instructional developer, (b) what skills and competencies do they need to possess to be "good" and (c) what kind of training/educational program can best help people gain those skills and competencies they need to be good.** (Silber, 1980, boldface as in original)

Purpose of this Paper

While there are currently no data-based analyses available, there is information about the characteristics of current ID training programs and the proposed competencies for ID Certification. In addition, there is a body of theoretical literature which suggests new and different competencies for ID'ers and thus new focuses for ID training programs.

This paper, then, will try to answer three questions related to those points identified above:

1. what skills are needed by a successful instructional developer?
2. can those skills be taught to prospective instructional developers?
3. if the skills can be taught, what are the best instructional strategies and resources for doing so?

It will address these questions within the context of answers provided by those advocating three different positions on the subject: (a) those advocating "specific ID skills;" (b) those advocating the addition of some "higher-level" skills to the list of specific skills; and (c) those advocating an "underlying skills" approach.

SPECIFIC ID SKILLS APPROACHES

"Specific ID skill" approaches are those which advocate that the training an instructional developer receives ought to consist of the set of specific ID skills the developer will be performing in any instructional development job (such as performing needs assessments, conducting task analyses, interacting with subject-matter experts, and evaluating instructional systems), and of the theory and knowledge underlying these specific skills.

Skills Needed

In this approach, the needed skills are identified by conducting a job or task analysis of what the instructional developer actually does when performing ID. This is usually done in several different settings (e.g., higher education, business and industry, military and government) to allow for situational differences. These analyses are then converted into lists of competency statements, and, sometimes, into behavioral objectives. Published examples of such competency lists can be found in Faris (1968), Hendrix and Tiemann (1971), AECT (1974), and DID (1980).

A comparison of the earliest with the most recent competency lists for instructional developers is shown in Table 41-1.

By looking at the DID (1980) list alone, and by comparing it with the Faris (1968) list, we can note the following:

1. The DID list seems to be a fairly complete one; it covers all the components of the ID process, including front-end and rear-end analyses,

Table 41-1.

Competencies for instructional developers--early and new (from Faris, 1968, p. 972 and DID, 1980, pp. 27-30).

Faris (1968)	DID (1980)
Application of System Design Concepts to Instructional Development	Select Appropriate Projects for ID
Analysis of Learners	Conduct Needs Assessment
Specification and Evaluation of Education Objectives	Assess Learner/Trainee Characteristics
Analysis and Sequencing of Tasks	Analyze Structural Characteristics of a Job, Task, and/or Content
Conceptualization and Application of Instructional Strategies	Write Statements of Learner Outcomes
Production of Stimulus Materials	Analyze the Setting Characteristics
Application of Adoption Strategies	Sequence Learner Outcomes
Conduct and/or Guide Research and Development Projects	Specify Instructional Strategies
	Sequence Instructional Activities
	Select Learning Resources
	Create the Specifications for Instructional Activities
	Seek Extant Instructional Materials
	Prepare Specifications for To-Be-Produced Materials
	Evaluate Instruction/Training
	Establish a Course/Training Package/Workshop Management System
	Develop an Instructional Development Project Plan
	Monitor Instructional Development Projects
	Communicate Orally and In Writing According to Accepted Societal and Professional Standards
	Use Appropriate Consulting Skills
	Use Appropriate Group-Process Skills
	Encourage the Diffusion and Adoption of Instructional Development
	Engage in Professional Activities

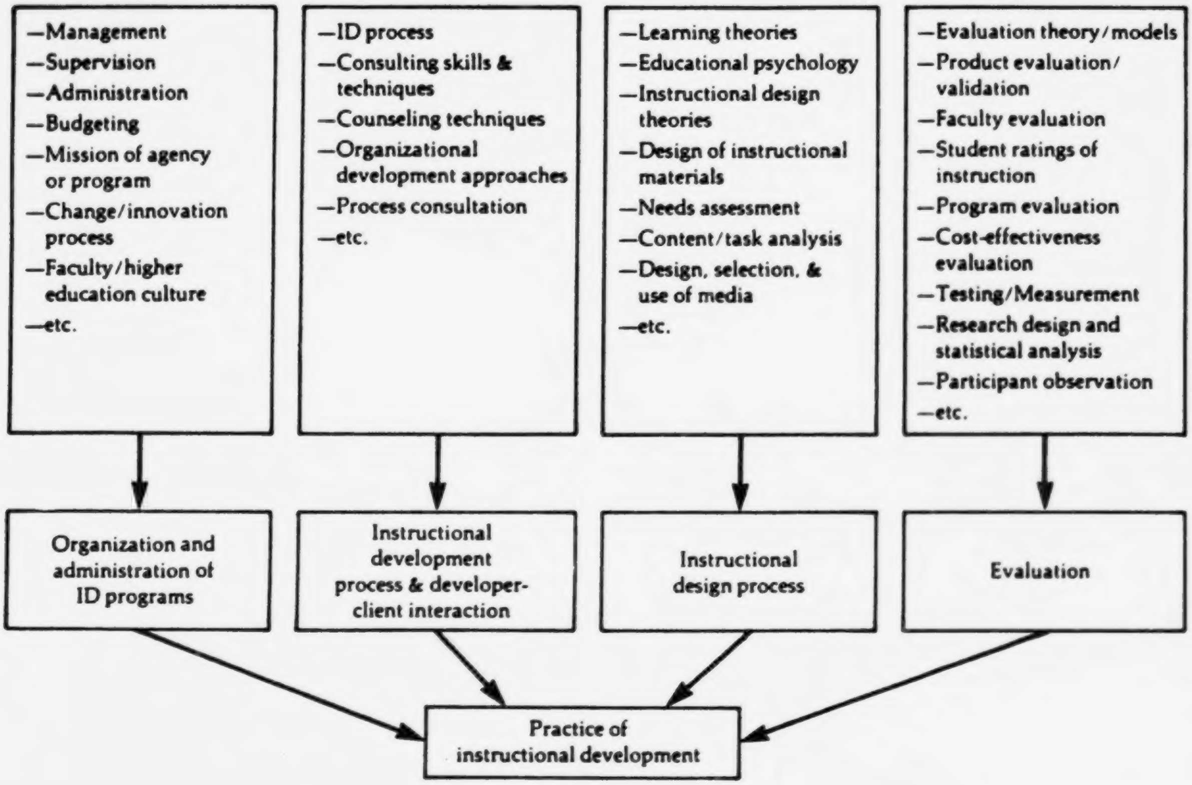

—Management
—Supervision
—Administration
—Budgeting
—Mission of agency or program
—Change/innovation process
—Faculty/higher education culture
—etc.
—ID process
—Consulting skills & techniques
—Counseling techniques
—Organizational development approaches
—Process consultation
—etc.
—Learning theories
—Educational psychology
—Instructional design theories
—Design of instructional materials
—Needs assessment
—Content/task analysis
—Design, selection, & use of media
—etc.
—Evaluation theory/models
—Product evaluation/validation
—Faculty evaluation
—Student ratings of instruction
—Program evaluation
—Cost-effectiveness evaluation
—Testing/Measurement
—Research design and statistical analysis
—Participant observation
—etc.
Organization and administration of ID programs
Instructional development process & developer-client interaction
Instructional design process
Evaluation
Practice of instructional development

Figure 41-1. Scope of the knowledge base for the activities of instructional development in higher education.

as well as all the support mechanisms (e.g., management, interpersonal skills, diffusion and adoption) needed to make ID an ongoing activity;

2. Faris' early list is very similar to the current DID one; while the DID list adds additional front-end analysis and evaluation and consulting skills, and makes more specific many of Faris' competencies, it has made no earthshaking additions to, or quantum leaps beyond, the list of skills generated 12 years earlier;

3. The skills given in both lists are "specific skills needed to perform instructional development," and make no reference to either (a) how these ID skills are similar to skills used in other professions, or (b) the existence of any underlying skills or abilities which might enable one to perform, or better perform, the specific skills.

These specific skills have been grouped into four areas by Durzo, et al., (1979) based upon clusters of similar skills. The four clusters, and the specific skills found in each, are shown in Figure 41-1. While this clustering helps to group similar specific skills together, it still serves to provide a listing of only the specific skills involved in the practice of instructional development.

Training Programs

Specific-skills approaches skip the question "Can these skills be taught?" and move directly to the question of how best to organize a curriculum to teach them.

How these specific skills, and the knowledge underlying them, are included in, and ranked in terms of importance by, institutions which train instructional developers is best shown in the selective study of nine institutions by Patridge and Tennyson (1978-79). Faculty members from each of these institutions were asked to rank ID and related competencies in terms of the emphasis they received in the master's and doctoral degree programs at each institution. The results from six of these programs are shown in Table 41-2.

Table 41-2. Ranking of Student Competencies in an Ideal Program.

Institution	Masters	Doctorate
Brigham Young U.	1-Development of a curriculum.	1-Development of a unit (course or program) of instruction.
	2-Experimental design.	2-Development of a curriculum.
	3-Theories of instruction.	3-Product evaluation.
	4-Theories of learning.	4-Course evaluation.
	5-The management of programs and personnel.	5-Evaluation of media materials.
	6-The administration of programs and personnel.	6-Program evaluation.
	7-The use of media equipment: video.	7-Design of media hardware/facilities.
	8-The use of media equipment: visual (photographic, graphics).	8-Data analysis.
	9-Course evaluation.	9-Theories of instruction.
	10-Program evaluation.	10 Experimental design.
Florida State U.	1-Development of a unit (course or program) of instruction.	1-(Other) Needs assessment/analysis.
	2-Development of a curriculum	2-(Other) Design of instructional systems.
	3-Test and measurement techniques.	3-Development of a unit (course or program) of instruction.
	4-Theories of learning	4-Theories of learning.
	5-Theories of instruction.	5-Program evaluation.
	6-Product evaluation.	6-Development of a curriculum.
	7-Program evaluation.	7-Product evaluation.
	8-Course evaluation.	8-Evaluation of media materials.
	9-Evaluation of media materials.	9-Theories of instruction.
	10-Use of computers.	10-Course evaluation.
Indiana University	1-Development of a curriculum.	1-Development of a curriculum.
	2-Development of a unit (course or program of instruction).	2-Development of a unit (course or program) of instruction.
	3-The use of media equipment: visual.	3-The use of media equipment: visual.
	4-Evaluation of media materials.	4-Production of media materials: visual.
	5-Production of media materials: visual.	5-Theories of instruction.
	6-The management of media resources.	6-Evaluation of media materials.
	7-The management of programs and personnel.	7-The management of media resources.
	8-The administration of programs and personnel.	8-The management of programs and personnel.
	9-Design of media hardware/facilities.	9-Product evaluation.
	10-Product evaluation.	10-The administration of programs and personnel.

Over all, the data from this study show that most programs ranked the specific skills and knowledge in the following order:

1. Development of a unit/course/program of instruction
2. Theories of learning and instruction
3. Evaluation of products/programs/courses/media
4. Management of programs and personnel
5. Production and management of media materials

With the notable exceptions of skills relating to interpersonal and group process consulting and to the encouragement of diffusion and adoption of ID, the emphases in these ID training programs matches fairly closely the lists of competencies for instructional developers shown in Table 41-1.

How these specific ID skills, and their relative emphases, are combined into a curriculum for ID students is best illustrated by the Instructional Design, Development and Evaluation program at Syracuse University. This program "is now completing a twenty-four month self-assessment which includes reviews of training and educational needs, curriculum analysis, and critiques by graduates in the field." (Durzo and Doughty, 1981)

The process followed by Syracuse is unique in that the practicing instructional developers at the Center for Instructional Development worked with the IDD & E Department faculty members as they

Table 41-2. (continued)

Institution	Masters	Doctorate
Syracuse U.	1-Experimental design.	1-Experimental design.
	2-Theories of learning.	2-Theories of learning.
	3-Test and measurement techniques.	3-Test and measurement techniques.
	4-Data analysis.	4-Data analysis.
	5-Theories of instruction.	5-Theories of instruction.
	6-Program evaluation.	6-Program evaluation.
	7-The management of programs and personnel.	7-Course evaluation.
	8-Development of a curriculum.	8-Product evaluation.
	9-Course evaluation.	9-All others.
	10-Production of media materials.	
U. of Iowa	1-Development of a unit (course or program) of instruction.	1-Development of a curriculum.
	2-Evaluation of media materials.	2-Theories of instruction.
	3-Management of media resources.	3-Program evaluation.
	4-Product evaluation.	4-Experimental design.
	5-Production of media materials: visual.	5-Course evaluation.
	6-Production of media materials: video.	6-Administration of programs and personnel.
	7-Production of media materials: audio.	7-Development of a unit (course or program) of instruction.
	8-Theories of instruction.	8-Evaluation of media materials.
	9-Test and measurement techniques.	9-Data analysis.
	10-The management of programs and personnel.	10-Theories of learning.
U. of Minnesota	1-Development of a unit (course or program) of instruction.	1-Theories of instruction.
	2-Theories of instruction.	2-Theories of learning.
	3-Product evaluation.	3-Data analysis.
	4-Program evaluation.	4-Experimental design.
	5-Development of a curriculum.	5-Test and measurement techniques.
	6-Theories of learning.	6-Product evaluation.
	7-Course evaluation.	7-Program evaluation.
	8-Evaluation of media materials.	8-Course evaluation.
	9-Test and measurement techniques.	9-Development of a unit (course or program) of instruction.
	10-Management of media resources.	10-Development of a curriculum.

would have with those from any other department--thus applying the "ID approach" to the redesign of the program. This is the first documented case of an ID department practicing what it preaches in its curriculum and course design.

The curriculum of the Syracuse IDD & E department is shown in Figure 41-2.

By looking at the curriculum alone, and by comparing it to the specific ID skills (Table 41-1), the grouping of these skills (Figure 41-1), and the rankings of these groupings (Table 41-2), one can conclude that:

1. The curriculum includes all the specific ID skills, groups them according to the identified areas, and emphasizes the most important areas and skills.
2. The curriculum seems to have breadth, depth, and appropriate sequencing in its course offerings.

Critique of Specific Skills Approaches

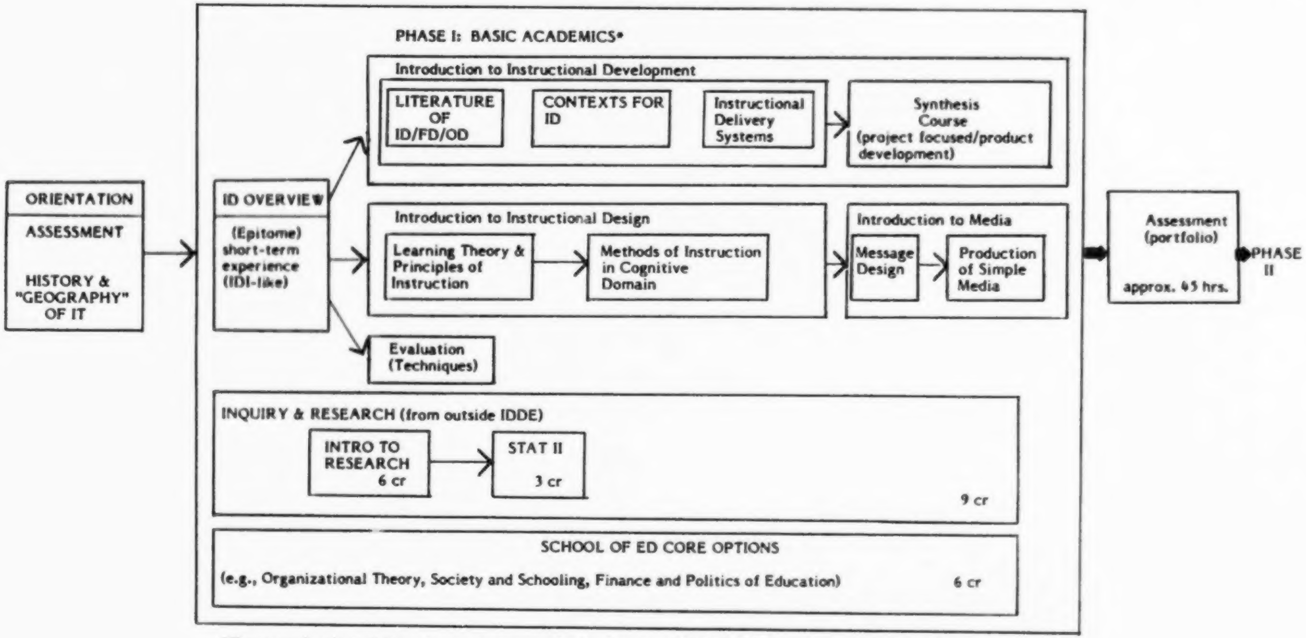
While the approach using the "specific ID skills" as the basis for training instructional developers produces an internally consistent curriculum--with courses matching competencies which match on-the-job tasks--the author believes there are several problems with using specific skills as the **sole basis** for training.

The first problem is that these approaches

Figure 41-2. IDDE curriculum overview. (Copyright 1981, Association for Educational Communications and Technology. Reprinted from the Journal of Instructional Development, 1981, Vol. 4, No. 3 with permission.)

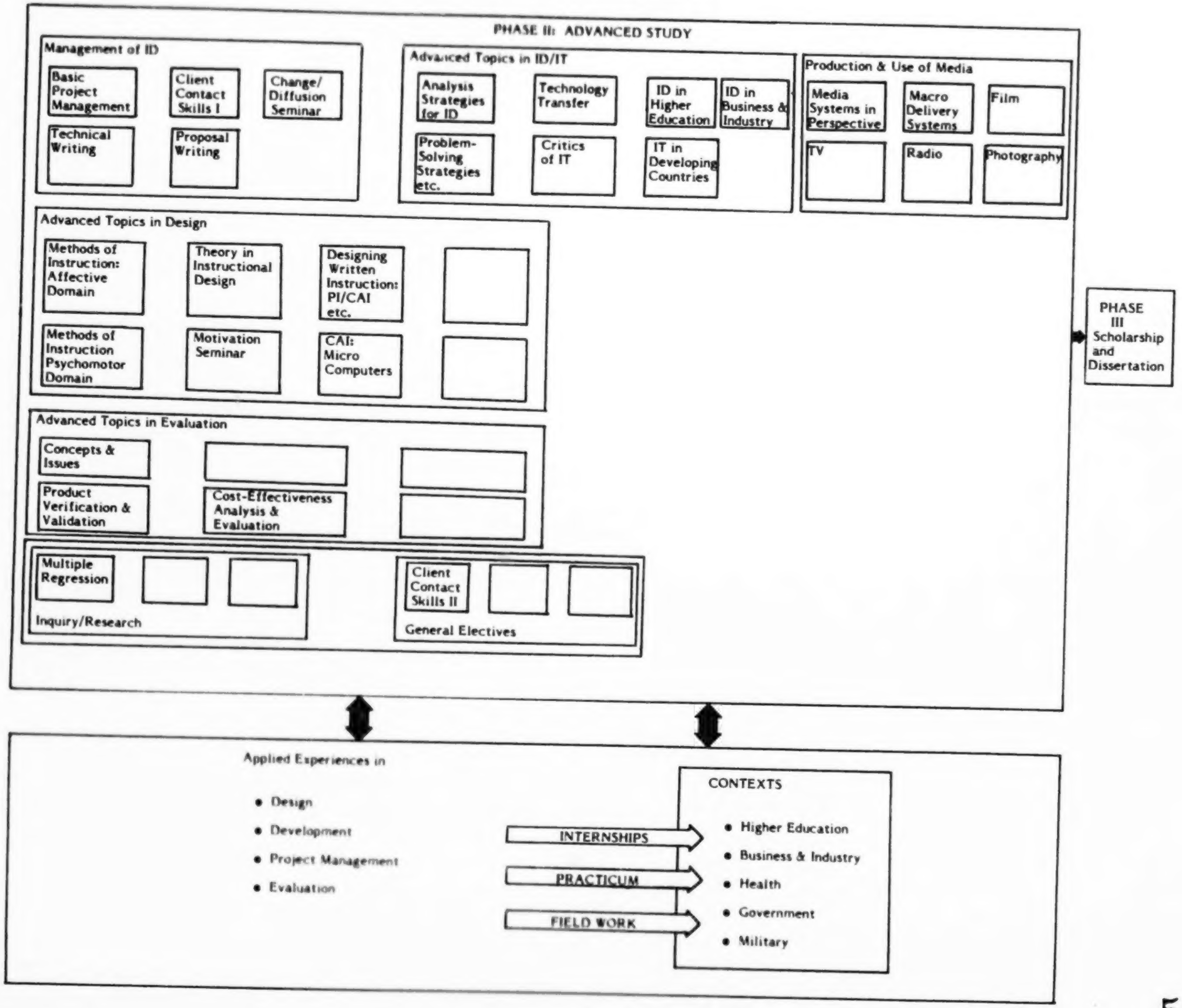
IDDE PROGRAM COMPONENT OUTLINE
Draft #10 2/1/80

(COMPONENT OUTLINE III)


PHASE I: BASIC ACADEMICS*
ORIENTATION
ASSESSMENT
HISTORY & "GEOGRAPHY" OF IT
ID OVERVIEW
(Epitome) short-term experience (IDI-like)
Introduction to Instructional Development
LITERATURE OF ID/FD/OD
CONTEXTS FOR ID
Instructional Delivery Systems
Synthesis Course (project focused/product development)
Introduction to Instructional Design
Learning Theory & Principles of Instruction
Methods of Instruction in Cognitive Domain
Introduction to Media
Message Design
Production of Simple Media
Evaluation (Techniques)
Assessment (portfolio)
approx. 45 hrs.
PHASE II
INQUIRY & RESEARCH (from outside IDDE)
INTRO TO RESEARCH 6 cr
STAT II 3 cr
9 cr
SCHOOL OF ED CORE OPTIONS
(e.g., Organizational Theory, Society and Schooling, Finance and Politics of Education)
6 cr

*Coursework selected depends on program emphasis of student (EdD/PhD/MA) and prior experience/coursework.

Figure 41-2. (continued)


PHASE II: ADVANCED STUDY
Management of ID
Basic Project Management
Client Contact Skills I
Change/ Diffusion Seminar
Technical Writing
Proposal Writing
Advanced Topics in ID/IT
Analysis Strategies for ID
Technology Transfer
ID in Higher Education
ID in Business & Industry
Problem-Solving Strategies etc.
Critics of IT
IT in Developing Countries
Production & Use of Media
Media Systems in Perspective
Macro Delivery Systems
Film
TV
Radio
Photography
Advanced Topics in Design
Methods of Instruction: Affective Domain
Theory in Instructional Design
Designing Written Instruction: PI/CAI etc.
Methods of Instruction Psychomotor Domain
Motivation Seminar
CAI: Micro Computers
Advanced Topics in Evaluation
Concepts & Issues
Product Verification & Validation
Cost-Effectiveness Analysis & Evaluation
Multiple Regression
Inquiry/Research
Client Contact Skills II
General Electives
PHASE III Scholarship and Dissertation
Applied Experiences in
• Design
• Development
• Project Management
• Evaluation
INTERNSHIPS
PRACTICUM
FIELD WORK
CONTEXTS
• Higher Education
• Business & Industry
• Health
• Government
• Military

focus upon the overt activities of the developer, and ignore the consideration of any underlying mental processes which might be occurring within the developer while performing them. For example, they assume that given a range of techniques for analyzing the structural characteristics of a job or content (such as task analysis or content elaboration procedures), and information about the job or content, the developer will be able to draw a flow-chart of tasks involved in the job or identify the epitomes and levels of elaborations of the content.

They ignore, however, the internal mental processing the developer must go through in analyzing and restructuring the information in her/his head before the finished "task/content analysis" is produced--that is, the internal mental processes which make it possible for the developer to use the techniques in the first place.

Admittedly, since these mental processes are internal, and therefore not observable, they are difficult to identify. A "common sense" analysis of this internal mental process is, however, attempted by Silber (1981b), who suggests the following internal process:

> a. The developer is presented with some **problem** related to learning and/or performance.
>
> b. The developer must gather information about the problem, analyze it, synthesize it into some coherent statement, and evaluate this statement in terms of reality.
>
> c. The developer is presented with a body of content related to the problem, usually in verbal written form, which s/he must learn or develop a cognitive structure for.
>
> d. The developer must **analyze** that body of content and **restructure (or synthesize)** it into a form that takes into account both the integrity of the content and the learning and instructional principles to be applied to it.
>
> e. The developer must **evaluate** the accuracy and adequacy of this restructuring, and **re-structure again** if the original attempt is not successful.
>
> f. The developer must translate the verbal written form of the content into other communication formats, such as visual and oral media. (Silber, 1981b, boldface as in original)

If this analysis is correct--and Silber presents some theoretical approaches which support it (to be discussed later in this paper)--then the internal mental processes of the developer include: gathering, analyzing, learning, synthesizing, evaluating, re-structuring, and translating information.

If these internal mental processes exist, and if the developer must use them in order to perform the specific ID skills, then it is clear that there is a serious omission from the competency lists, and from the curricula used by those advocating specific-skills approaches. The lists and curricula contain no reference to these internal mental processes--either as course content, as instructional strategies, or as screening criteria which would ensure that developers had these mental processes so that they could apply the specific skills.

The second problem with specific-skill approaches is related to the first problem just discussed. These approaches **never address the question** "Can these skills be taught?"

As long as one assumes that the specific ID skills are the total repetoire of skills to be learned, one can argue that this is a moot question; the skills can be taught to most master's and doctoral level students--and we have been doing so in ID training programs for almost 15 years.

When one looks at the quality of the performance of the graduates of these ID programs, however, one may find that this claim of success needs to be tempered a bit.

The following contention should come as no surprise to anyone who has trained, employed, or worked as an instructional developer (though the author is the first to admit that there is no hard evidence to support it):

Not all graduates of ID training programs attain the same grades in ID courses, receive equally laudatory recommendations from faculty members, seem equally qualified to prospective employers during interviews, and receive equally positive on-the-job performance evaluations.

Some may argue that this contention is not supported by research, and is therefore meaningless--or is even not true; some may argue that it is so obvious and trivial that it is not even worth pointing out; some may argue that it is true, but can easily be explained through the phenomenon of "individual differences," and therefore tells us nothing.

The author believes, however, that these arguments of meaninglessness only apply within the context of the "specific skills" approaches to ID training. When one looks beyond them, the differences in performance-level take on great significance.

Could it be that the individual differences found in the ability to learn and perform the specific ID skills are related **not to the specific skills themselves, but rather to some set of underlying mental processes** which enable one to apply the specific skills--perhaps the mental processes listed above?

Could it be that one must be able to use, or learn to use, these mental processes in order to successfully learn and apply the specific ID skills--and that without these mental processes, one cannot learn and perform the specific ID skills at an optimal level?

Whether "yes" is the answer to these questions (as this paper will attempt to demonstrate in a later section) or not, the author believes that they are questions well worth asking. The fact that specific-skills approaches ignore them, and do not address the question "Can the skills be taught?" seems to be a second serious omission on the part of those advocating these approaches to training.

A third and final problem with the specific-skills approaches is their inability to prescribe the instructional strategies and learning activities to be used in the courses in their curricula (a fault of the curriculum, for example, which is proposed in Figure 41-2).

Ideally, such programs would be designed through the use of the ID process they teach; their designers would systematically sequence the content, select instructional strategies, media and techniques, and employ principles from a theoretically-based science of instruction derived from the structure of the content being taught and the characteristics of the learner population.

In reality, sad to say, this is not the case. Most ID trainers will admit privately--though not for citation in a paper such as this--that they either use one of the "major texts in the field" (such as Gagne and Briggs, 1979) supplemented by lectures and projects, or use a commercially-produced or locally-developed self-instructional package. Further, they privately admit that this selection is made **not** through the systematic approach they advocate, **but rather** by trainer preference for either the content included in the materials or for the instructional strategy employed.

This point is made not to criticize ID trainers--the author is as guilty of this approach as is anyone else--but to emphasize another problem with the specific-skills approach.

Could it be that the teaching of specific ID-skills suggests no inherently superior instructional strategy?

Further, could it be that if one attempted to address underlying mental processes one would find a much clearer direction to follow in the selection of instructional strategies and learning activities?

While the author will attempt to answer the second question in the affirmative later in this chapter, at this point it seems sufficient to say that the omission of the discussion of instructional strategies and learning activities is a third weakness in the "specific-skills approaches" to training instructional developers.

In summary, then, while specific-skills approaches provide an internally consistent curriculum for training instructional developers, there are three problems with such approaches: (a) they ignore the consideration of underlying mental processes; (b) they do not address the question "Can the skills be taught?" (c) they do not indicate which instructional strategies and learning activities would most effectively teach the skills.

HIGHER-LEVEL SKILLS APPROACHES

"Higher-level skills" approaches are those which are based upon the assumption that the instructional developer ought to use conceptualizing and creative skills, rather than mere "rule-using" skills, in performing ID, and that training programs ought to include experiences which help students to develop these abilities.

Skills Needed

The two higher-level skills addressed in the literature are (1) comprehending the content of the discipline in which the developer is working (Bratton, 1981), and (2) working at the "creating" rather than at the "rule-using" level while doing design (Markle, 1981). Both of these higher-level skills, it should be noted, are parts of the internal thought-process underlying ID, described earlier in this paper.

Comprehending Content. In the performance of their jobs, instructional developers frequently work with subject matter which is unfamiliar to them. This is a matter of real concern to ID students and practitioners, as Bratton (1981) notes:

> Graduate students question their ability to work in content areas other than those with which they are already familiar, and practicing developers note the added effort placed on them when they must learn a new content area in order to help a client. (Bratton, 1981)

How does the developer go about learning an unfamiliar content area and developing a conceptual structure for it? According to the literature reviewed by Bratton, there is no general theme or organizational principle across the various fields of knowledge which would enable a developer to master some universal scheme, and then to quickly apply it, in order to understand new content areas.

Faced with this difficulty, Bratton points out that the skills needed by developers in order to learn about new subject matter are similar to the skills ethnographers use in order to learn about new cultures. He suggests that the interviewing techniques ethnographers use may be useful to instructional developers.

The strategy he proposes is based upon the use of three types of questions in discussing the content of an area with someone who is a subject-matter expert in it:

1. Descriptive questions--questions which are global in nature, and open-ended; they are designed to get the SME talking about the content, and are used to discover relevant follow-up questions.
2. Structural questions--questions which are more specific. These are used to gather detailed information about a particular topic and are used to test the developer's understanding of the content;
3. Contrast questions--questions which are more specific yet; these are directed at

> discovering the meaning of discrete facts and concepts and the relationships among them. (Bratton, 1981)

He suggests that the interview with the SME take the following format: "descriptive and structural questions are asked early and throughout the interview with the eventual interspersing of contrast questions." (Bratton, 1981)

Thus, one of the higher-level skills needed by the developer is a questioning technique designed to help the developer to learn about and develop a conceptual structure for new content.

Creating. The low level of behaviors required by most instructional systems reflects, according to Markle (1981), the relatively low level of thinking done by instructional developers during the ID process. In what she calls a "simplification over elaborate models," Markle suggests three levels of behavior: remembering; using; creating.

We are fixated on the rule-using level in most of the instruction we design (such as the use of the RULEG format), she maintains--even though the sophistication of the designs which would really be appropriate for such instruction is far beyond such simple formulas.

If the instruction we design is at the "rule using" level, what about the thinking behavior of the instructional developers themselves? Markle says:

> It strikes me that our real progress in instructional design has been in the increasing sophistication of the analysis processes required of designers. Designers are... operating squarely in the top row creating , even when the instruction they are to design is not at the forefront of the discipline. (Markle, 1981)

How do instructional developers show this "creating" skill, so that they can then apply it to the instruction they design? Markle suggests that the key to this problem lies in the use of problem-solving skills. To identify what the specific elements that make up problem solving are, she indicates that

> ...in research and in practical applications, there is an emphasis upon developing protocols of thinking processes--blow-by-blow descriptions of how the thinker is proceeding through the problem. (Markle, 1981)

Thus, a second higher-level skill needed by developers is the ability to operate at the "creating" rather than at the "rule-using" level in their design of instruction--a skill which can be described by developing protocols of the thinking processes the developer uses in solving a problem.

Training Programs

Advocates of the higher-level skills approaches do not yet seem able to answer the question "Can these skills be taught?"--though Markle indicates qualified success in teaching her students to train their students to think, implying that if these skills can be taught to the developer's students, they can also be taught to the developers.

In addressing the question of how to teach higher-level skills, Markle indicates that there

> ...are several rich lodes to be mined for anyone who wants to think about thinking, among them the Piagetian exercises from Renner's group (Renner et al., 1976), the Guilford-based series by Sampson (1975), the eclectic course materials from Whimby and Lochhead (1979), and the creativity exercises of Parnes (1967), as well as the brain twisters that research psychologists have been using for years. (Markle, 1981)

To train students to develop conceptual structures for new content, Bratton suggests four training opportunities:

1. Formal study in academic fields outside the area of ID and the College of Education...
2. Formal study and discussion of the task of working with unfamiliar content...
3. Formal practice in questioning and interviewing...
4. Internship experiences to observe ID practitioners on the job in SME interviews...(Bratton, 1981)

Critique of the Higher-Skills Approaches

Higher-level skills approaches take an important step beyond the specific-skills approaches by indicating that there are indeed skills that an instructional developer must possess other than those given in skill/competency lists.

They suggest that in order to "analyze the structure of a job, task, and/or content," the developer must construct in her/his own mind a conceptual structure of that subject matter, and must use some external questioning strategy, governed by some internal mental process, to do so. They also suggest that developers must operate at the "creating," rather than merely at the "rule-using" level implied by the specific-skills approaches, in order to design useful and relevant instruction, and that to do so an internal thinking-process which can be described through protocols is involved.

The problem, then, with higher-level skills approaches is **not** what they advocate, but rather with how far they take their ideas--both in theory and in applications for training.

While they identify the existence and importance of the higher-level skills required of a developer, they do not describe the nature of those skills in a precise way. Further, they do not indicate whether these are the **only** higher-level skills required, or whether there might be others that are also important. Finally, these approaches do not link the internal mental processes they postulate to any theoretical model.

In terms of training for developers in the higher-level skills, these approaches do make some suggestions, but the suggestions are neither specific enough to be turned into curricula, instructional strategies or learning activities, nor are they approached in the systematic manner required in order to develop validated instruction.

In summary, then, higher-level skills approaches make a contribution by adding a missing dimension to the specific-skills approach, but the result is still insufficient because the advocates of the higher-level skills approaches do not go far enough in identifying the nature of the higher-level skills or of the training needed to master them.

UNDERLYING-SKILLS APPROACHES

"Underlying-skills approaches" are those which are based upon the assumption that the internal thinking-processes or cognitive strategies a developer uses to guide her/his ID efforts are the most important set of skills a developer must possess in order to be successful. S/he must possess these underlying skills in order to properly and appropriately exercise either the basic skills or the higher-level skills; and if s/he attempts to exercise these basic or higher-level skills in the absence of the underlying skills, s/he will do so only on the level of rule-following, probably poorly, and certainly not creatively.

The main thesis of the underlying-skills approaches, as stated by Silber, declares that:

> There is a basic set of **underlying skills** required of the instructional developer--skills which enable her/him to learn the specific ID skills in the first place, and to apply them successfully on the job. (Silber, 1981b)

Skills Needed

In underlying-skills approaches, the skills needed are identified in terms of the internal thought processes that take place while performing the ID process (as suggested above by Markle). They begin with the "common sense" of the internal mental processes as suggested by Silber earlier in this chapter, make them more specific and tie them to existing theoretical bases.

Wallington's Generic Skills. Deriving his list from the ID literature, Wallington (1981) identifies five generic skills:

1. interpersonal communication skills;
2. comfortably receiving and assimilating large amounts of new information; creating a logical structure for that information, and testing the information against that structure so that additional information can be assimilated; and seeking new information which will help to further develop the structure of the information--all of the foregoing done in conjunction with other persons as the source of information;
3. creative problem-solving of practical problems...;
4. the application of the behavioral sciences to instruction;
5. seeking and locating information from data bases and developing appropriate search strategies for each source of information--the foregoing done with information previously stored, usually in printed or test format....(Wallington, 1981)

It should be noted that the skills of receiving and assimilating new information and of creative problem-solving match the "higher-level skills" of Bratton and Markle discussed earlier, but Wallington's list increases the number of such skills. In addition, Wallington notes the importance of specific instructional-development skills.

Recognizing the need for further delineation of these generic skills, Wallington suggests two approaches to doing so. First, he notes that:

> If they are truly generic skills, they should be applicable in a variety of situations in instructional development. By analyzing those applications, a series of protocols can be developed to offer guidance for the practicing instructional developer....(Wallington, 1981)

Second, he indicates the need to go beyond ID frameworks. The three sources he proposes are: (a) the job analysis field; (b) models and taxonomies of learning psychology; and (c) Guilford's Structure-of-Intellect Model of human intelligence (based upon ideas presented in Silber, 1981b).

Wallington himself further delineates one of the generic skills--the ability to assimilate new information. Going beyond Bratton's ethnographer analogy, he relates this skill to the ability

> ...to take a standardized test (any subject) and do well, and/or to easily learn a new language, and/or to quickly learn a role or part (become a "quick study"). (Wallington, 1981)

The existence of these generic skills, he concludes, demonstrates that instructional development is more than a simple technical process--as conceptualized by "specific skills approaches"--and that practicing developers are more than technicians, because they use complex and pervasive internal thought-processes as the basis for their ID work.

Silber's Analysis, Based upon Gagne, Piaget and Guilford. Silber (1981b) attempted more comprehensive identification of the internal thought-processes underlying ID, the delineation of their components, and the linking of them to theoretical models. Beginning with the "common-sense analysis" of the thought processes described earlier, and with Wallington's list of generic skills, Silber attempted to: (1) identify the nature of the underlying skills according to Gagne's types of capabilities; (2) delineate the nature of the underlying skills in terms of Piaget's stages of intellectual development; and (3) delineate the nature of the underlying skills in terms of Guilford's Structure-of-Intellect model.

1. **Nature of the Underlying Skills.** If one looks at the specific ID skills as separate entities, Silber argues, they can be seen, in terms of Gagne's types of capabilities, as Intellectual Skills:

> Intellectual skills are capabilities that make the human individual **competent.** They enable him to respond to conceptualizations of his environment...Learning an intellectual skill means learning **how to do something** of an intellectual sort. (Gagne and Briggs, 1979)
>
> (Boldface as in original)

More specifically, applying the specific ID skills can be seen either as Rule-Using or as Problem-Solving Level Intellectual Skills--depending upon which of the levels earlier identified by Markle that the developer is working on.

However, when analyzing the underlying skills of ID--the internal thought-processes a developer uses--it is more correct and useful to view them as a Cognitive Strategy:

> ...a cognitive strategy is a **control process,** an internal process by means of which learners select and modify their ways of attending, learning, remembering, and thinking...A cognitive strategy is an **internally-organized** skill that selects and guides the internal processes involved in defining and solving novel problems...cognitive strategies have as their objects the learner's own thought processes. (Gagne and Briggs, 1979) (Boldface as in original)

The capabilities used in defining Cognitive Strategy, Silber concluded, describe the **internal thought-processes** which **underlie** and **control** the use of the specific ID skills.

While Gagne and Briggs assert that it is difficult to describe cognitive strategies, since they are internal processes, Silber believes that the particular strategy underlying and controlling ID can be described. Because the developer's thought processes begin when s/he is presented with a problem, and end when that problem is solved as described in the "common-sense" analysis presented earlier, the cognitive stratgegy can be described as an **internal problem-solving** process, and delineated through a problem-solving model.

It is important to note here (Wallington, 1980) that problem-solving as discussed here is **not** the Intellectual Skill, in which the process is applied to **external** situations. Rather, problem-solving here is an internal thought-process, used **internally** to **control** the developer's thought processes.

Based upon Guilford's (1967) endorsement of Rossman's (1931) set of problem-solving steps, and upon Guilford's ability to combine these steps with his Structure-of-Intellect categories in developing an operational model for problem-solving, Silber uses Rossman's steps to describe the internal problem-solving cognitive strategy. These steps are listed here:

1. Need or difficulty observed
2. Problem formulated
3. Available information surveyed
4. Solutions formulated
5. Solutions critically examined
6. New ideas formulated
7. New ideas tested and accepted
   (Rossman, quoted in Guilford, 1967)

To summarize the discussion of the nature of the underlying skills, Silber proposed two theses:

1. There is an integral thought-and-control process--a Cognitive Strategy--which underlies the use of specific ID skills.
2. The Cognitive Strategy underlying ID is an internal problem-solving thought-and-control process. (Silber, 1981b)

With the nature of the underlying skills identified, Silber next moved to attempt to delineate the components, or subordinate skills, that make up the internal problem-solving thought-and-control process. He found two theoretical models through which this can be done.

1. **Delineation in terms of Piaget.** The first theoretical model which provides a framework for this delineation is that of Piaget's Stages of Intellectual Development. (Inhelder and Piaget, 1958).

A succinct and relevant comparison of the two stages that are related to the cognitive strategy under discussion is shown in Table 41-3 (Harmon and King, 1979).

Based upon the characteristics of Formal Operations, it is clear that **Formal Operations are components of, and required for, the internal problem-solving cognitive strategy underlying ID.**

Components of that cognitive strategy, according to the list Silber (1981b) derived from Harmon and King (1979), are:

-- use of models
-- use of relationships between two or more variables
-- generation of hypotheses
-- thinking in terms of abstract patterns, concepts, principles
-- awareness of own reasoning

Table 41-3. Analysis of the instructional implications of the interaction between the concrete and formal aspects of information to be learned and the developmental level of the student.

Developmental Level of Students	Nature of information to be learned CONCRETE INFORMATION	 FORMAL INFORMATION
CONCRETE OPERATORS	NO PROBLEMS Use normal instructional techniques.* Theory should be confined to representational models or images.	PROBLEMS! Specific tasks should be reduced to the point where they can be solved by concrete operators. And since one shouldn't expect good retention, one should be prepared to aid the student during actual performance.
FORMAL OPERATORS	NO PROBLEMS Use normal instructional techniques.* Theory can be representational or abstract.	NO PROBLEMS Use normal instructional techniques.* Theory should be abstract or formal.

*These techniques may include job aids, but in these cases the job aids will not necessarily serve to reduce the complexity of the information on the job aid.

- -- checking on validity of conclusions
- -- identifying and abstracting a pattern that a particular problem typifies, and using the knowledge of that pattern to be systematic in solving the problem
- -- predicting a number of different possibilities relative to a given situation
- -- considering what actually exists at the moment, and what other possibilities are latent in the particular situation
- -- coordinating two or more disparate referential systems.

Thus, Piaget's notion of Formal Operations not only supports the concept of a set of underlying skills, but also delineates what those skills are. This lead Silber to conclude that:

> The characteristics of Piaget's Formal Operational Thought provide a theoretically-based identification of the components of the internal problem-solving thought-and-control Cognitive Strategy underlying ID. (Silber, 1981b)

2. **Delineation in terms of Guilford.** The second theoretical model that provides a frame work for the delineation of the Cognitive Strategy is Guilford's (1967) Structure-of-Intellect (SI) Model.

The model, shown in Figure 41-3, considers 4 types of Content, 5 types of Operations performed on the content, and 6 Products that result.

In a key study applying the SI Model to problem-solving, Merrifield et al. (1962) hypothesized six abilities that make up problem-solving and related them to the cells in the SI Model. The abilities were to:

1. think rapidly of several attributes or characteristics of a given object
2. classify objects or ideas
3. find different relationships
4. think of alternative outcomes
5. think of attributes of a desired goal
6. deduce logically-sufficient antecedents

Parenthetically, it should be noted that these abilities are extremely similar to the characteristics of Formal Operational Thought identified above.

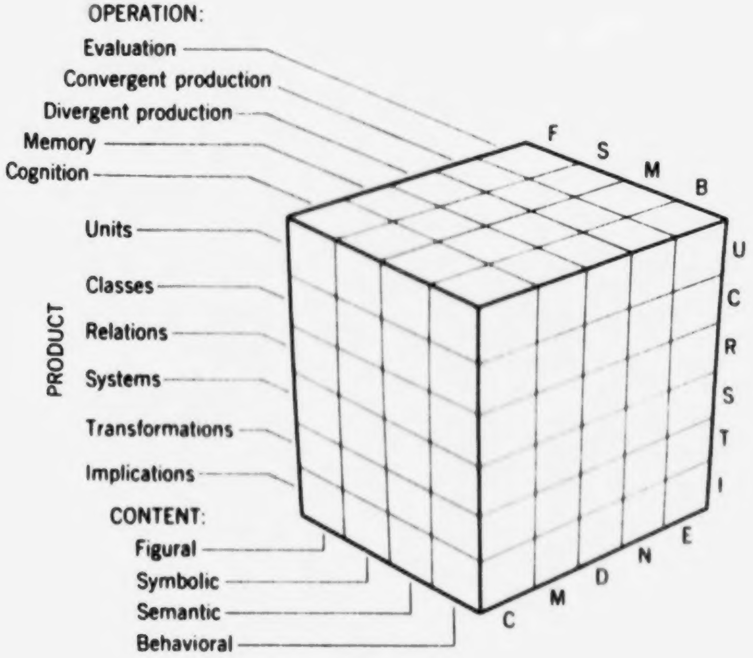


Figure 41-3.

Results of the Merrifield study showed that the six hypothesized problem-solving abilities "tested in this study can be explained in terms of factor dimensions that have logical positions in the structure-of-intellect." (Merrifield et al., 1962).

The 12 structure-of-intellect factors that make up problem-solving, as identified by this study, are listed below--by both the SI cell indicator and by the common name for the represented ability:

CMU - verbal comprehension
CMC - conceptual classification
CMR - awareness of conceptual relations
CMS - general reasoning
CMI - conceptual foresight
DMU - ideational fluency
DMR - associational fluency
DMT - originality/spontaneous flexibility
NMC - production of categories of meaning
NMR - production of conceptual correlates/relations
NMI - deduction
EMI - sensitivity to problems
(Merrifield et al., 1962)

Thus, Guilford's Structure-of-Intellect Model also supports the concept of underlying skills, and also delineates--in a different manner--what those skills are. This lead Silber to conclude that:

> Guilford's Structure-of-Intellect Model provides a theoretically-based identification of the 12 factors which make up the internal problem-solving thought-and-control cognitive strategy underlying ID. (Silber, 1981b)

Delimitations and Tests of Silber's Analyses. Despite their apparent logical soundness, Silber admits that his conclusions are merely hypotheses, and that there is no positive or negative evidence to suggest a relationship between the ability to conduct ID well and the possession of Piaget's Formal Operational Thought or Guilford's Problem-Solving SI factors. He also admits that the above analysis has some built-in limitations.

1. **Tests of the Theoretical Frameworks.** To support the validity of his ideas regarding the nature and delineation of the skills underlying ID, Silber reported the results of recently-completed pilot study, and suggested research needed in the future.

In the pilot study (Woodward, Silber, and Jahn, 1981), the relationship between possession of Formal Operational Thought and success in an instructional development course was studied. Possession of Formal Operational Thought was measured by the Test of Level of Thinking (TOLT;

developed by Tobin and Capie 1980a, 1980b) and shown to be both reliable and valid.

Results of the study showed that the score on the total TOLT--as well as upon the specific questions measuring "control of variables" and "combinatorial reasoning"--correlated .70 with (a) course grade, (b) conceptual grasp (as opposed to mere performance) of the ID process, and (c) a subjective rating of "ID competence" given by the instructor.

Silber claims that:

> These results indicate a strong relationship between the possession of Formal Operational Thought and both the ability to **do** instructional development well and the ability to **understand** what the ID process is and how and why it works. They support Theses 1 through 4--that is, there is an internal, problem-solving thought-and-control cognitive strategy underlying ID which is based upon the components of Piaget's Formal Operational Thought. Further, they suggest that possession of this cognitive strategy is necessary in order to apply the specific ID skills well. (Silber, 1981b)

Since these results come from a pilot study, and since no study has been done linking Guilford's SI factors to ID, Silber proposes that more-extensive and better-controlled studies be done to test the relationship of both of his theoretical formulations to ID, and to compare the two theories as delineations of the cognitive strategy underlying ID.

2. **Limitations of the Theoretical Frameworks.** The frameworks of Piaget and Guilford, and the studies reported to support them, do **not** address all possible underlying skills, according to Silber (1981b). While they address those skills underlying a major portion of the ID process--the cognitive processing of information in written and verbal forms--they **do not address** the skills underlying Wallington's (1981) "generic skill" of interpersonal communication, and in the area addressed by the literature on "visual literacy."

What is, and is not, addressed can best be understood in terms of the four types of content identified by Guilford: Semantic (words); symbolic (signs/codes); figural (images); behavioral (nonverbal, signs and signals conveyed through human interactions, feelings).

The Piaget and Guilford frameworks address only the semantic and symbolic types of content, thus omitting the remaining two content types which have great potential for use in the identification of underlying skills.

Silber recognizes the importance of behavioral content (for interacting with others) and figural content (for media production) in identifying the complete set of underlying skills. He suggests that when sufficient research and theory development has occurred with respect to these content types, an analysis similar to that outlined earlier for semantic and symbolic content can be attempted for these areas.

Summary. This extensive section on the skills needed by instructional developers according to "underlying skills approaches" has presented a description of the internal thought processes of the instructional developer from the point of view of Wallington's five "generic skills"; identified these thought processes as underlying skills in the form of a cognitive strategy; described that cognitive strategy as an internal problem-solving thought-and-control process; delineated the components of that internal problem-solving cognitive strategy in terms of characteristics and attributes of Piaget's Formal Operational Thought; delineated the components in terms of Guilford's Structure-of-Intellect Factors; reported a pilot study which supports the relationship between the possession of Formal Operational Thought and the ability to do and understand ID; proposed further needed research; and identified the limitations of the current underlying-skills analysis in terms of the type of content addressed.

Critique of the Underlying Skills Approaches

Due to the newness, the extensiveness, and the complicated nature of the "needed skills" identified by underlying-skills approaches, it seems appropriate to critique these approaches at this point and to present and critique suggestions for training developers in the use of these skills.

There seem to be four major strengths and three major weaknesses in the underlying-skills approaches to teaching the skills needed by the instructional developer. (The reader should note that the author is an advocate of, and one of the major writers about, this approach; thus, while he will try to be objective in this critique, some of his biases are bound to intrude themselves into this critique.)

The first strength is the degree to which advocates of underlying-skills approaches tie their analyses of needed skills to **theoretical frameworks.** In contrast to "specific skills" approaches--which are based upon competency lists developed from observations of what the developer does on the job--underlying-skills approaches are based upon theoretical frameworks which have been used and validated through research and application in fields outside of ID. Thus, while specific-skills approaches can provide only **internal validation** for their competency lists, the underlying-skills approaches seem to provide an **externally validated** set of skills which have been shown to have a wide range of applicability in other fields. The underlying skills identified, therefore, can be said to be based not only upon pragmatic analysis of what happens in ID (where the specific-skills approaches stop), but also upon theoretical frameworks which have been validated outside the ID field, and upon skills, derived from those theories, which have been shown to exist in fields other than ID.

This conclusion leads to the second major strength. Based upon these theoretical frameworks, advocates of underlying-skills approaches seem to present a very **convincing argument** that underlying skills do exist, and present very **plausible delineations** of what these underlying skills are. It was noted in the critique of the specific-skills approaches that they seemed to ignore the internal mental processes that the developer had to use in order to perform the ID skills, and that such internal mental processes, based upon a "common sense" analysis, seemed to function in an important role in this performance. The theoretical work of Gagne, Piaget, and Guilford seems to clearly point to the existence and importance of underlying, internal mental processes which control and guide human cognitive activities. Further, despite the difficulty in describing processes which cannot be seen, the theoretical work of Piaget (Formal Operational Thought) and of Guilford (Structure-of-Intellect factors in problem-solving) provide clear delineations of what the components of those internal mental processes are.

Validation of their ideas through **research** is the third major strength shown by advocates of the underlying-skills approaches. Though the results come only from a pilot study, the .70 correlation between the possession of Formal Operational Thought and the ability to both do and understand ID is strong data-based evidence that underlying skills do exist and affect the ability to do ID.

Finally, the fourth major strength shown by advocates of underlying-skills approaches is their ability to explain the observation, noted earlier, that not all graduates of ID programs can perform ID equally well. While this point may seem meaningless when viewed in the light of specific skills, it takes on great significance when viewed in the light of underlying skills. It seems plausible to argue that the observed differences in performance of the specific ID skills result from varying degrees of the presence or absence of the underlying cognitive strategy. One may, for example, master the rules for performing a task analysis, but if one does not possess the cognitive strategy underlying ID, one may not know when to use those rules, or one may not be able to assimilate and restructure the associated content into a usable synthesis, or one may be unable to deal with the relationships among the information presented, the task/content analysis procedures, and the relations to be expressed by the finished synthesis. The possession of the underlying cognitive strategy may be the "individual difference" which explains varying levels of performance--and if it is, it is not a meaningless difference.

While the major weaknesses of the underlying-skills approaches are all acknowledged by those writing in the area, they are weaknesses nonetheless. The first major weakness is the lack of a delineation of those skills involved in the behavioral and figural content areas. "Developer-client interaction" is one of the four areas of ID skills identified by Durzo et al. (1979), and any practicing developer can attest to the importance of interpersonal or consulting skills in performing ID; but as a result of a lack of research and theory in this area, underlying-skills approaches have nothing to say about the cognitive strategy which underlies this behavioral content. Further, developers are frequently called upon to develop story-boards for mediated materials, and/or to evaluate already-produced mediated materials--a skill clearly involving figural content--but, again, underlying-skills approaches have nothing to say about the cognitive strategy underlying figural-related skills.

The second major weakness of the underlying-skills approaches is the insufficiency of the research evidence in support of its conclusions. Though the pilot study reported earlier does support the ideas presented, as indicated above, it still is only a pilot study conducted at one institution. In addition, the study relates the ability to do ID only to Piaget's framework; there is no research evidence at all connecting the Guilford framework with the ability to do ID. Clearly, more extensive research upon the relationships of **both** theories to ID is necessary in order to fully confirm the conclusions drawn.

Finally, the third major weakness is the presentation of two possible theoretical delineations of the cognitive strategy--one based upon Piaget and the other upon Guilford--and the lack of comparative evaluation of the utility of the two approaches. Must we use both frameworks to fully describe the cognitive strategy? Can we describe it using only one? If so, which one is more accurate? More useful? More useable? Silber (1981b) suggests some advantages and disadvantages to each approach, but he admits that these are personal views--not supported by research and probably not agreed upon by others. This presentation of two possible theoretical delineations, without drawing a conclusion about which to use, is likely to leave the potential user confused and without direction.

Over all, it seems that the strengths of the underlying-skills approaches greatly outweigh their weaknesses. Since the strengths lie within the areas of new insights, new theoretical bases, and new explanations of phenomena, they indicate that underlying-skills approaches are an important new approach to the identification of those skills an instructional developer must have in order to be successful.

The weaknesses, however, all fall within the category of "more work is needed," and can be remedied as more people begin to study the ideas inherent in these approaches.

TRAINING ACCORDING TO UNDERLYING SKILLS APPROACHES

Developing the underlying skills in instructional development students is not as simple a matter as it is in the case of the specific skills or the higher-level skills.

First, there is debate concerning whether or not these skills can, in fact, be taught at all - a question neither of the other two approaches has even addressed. Given the internal and complex nature of the underlying skills, this is indeed a valid and important question to be asked. Different answers emerge, however, from the analyses of the two major theories upon which this approach has so far been based.

Second, the prescriptions for training that do emerge resemble the ambiguous, general ones put forth by higher-level skills approaches more than they do the specific curricula put forth by the specific-skills approaches.

Can the Skills Be Taught

Many ID trainers will see this as a moot question. Since, according to Piaget, one reaches Formal Operational Thought at age 15, and since their students are older than that, they would argue, there is no need to teach the internal problem-solving thought-and-control cognitive strategy underlying ID at all--students already possess it.

Unfortunately, this is not the case, as studies cited by Harmon and King (1979) indicate:

> ... from 40 to 60 percent of sampled college students function at the concrete operational level....
>
> ... many adults (who function at the formal operational level with content with which they are familiar) function at the concrete level when they interact with tasks with which they are not familiar (Harmon and King, 1979)

This conclusion was borne out by the pilot study cited earlier (Woodward, Silber, and Jahn, 1981) in which only 67.5% of the students, with a mean age of 35, functioned at the formal operational level.

"Can the skills be taught?" is, then, a valid question which must be answered. After reviewing some weak but positive answers presented by Guilford (1967) and Gagne (1977), Silber (1981b) supports the **negative** conclusions reached by Harmon and King (1979) and Gagne (1977):

> Insofar as we can teach **formal operational thought**, suffice it to say that it takes a lot of time and effort and is only partially successful. (Harmon and King, 1979) At the same time,...it has not been easy to show that deliberate attempts to teach cognitive strategies result in consistent and substantial learning and transfer of learning. Regardless of the nearly universal agreement on the educational goal of "teaching students to think," the evidence that this goal can be successfully accomplished when deliberately undertaken is actually quite meager at present. (Gagne, 1977).

Silber thus concludes that "there is very little evidence at all that cognitive strategies [and formal operations] can be taught to adults." (Silber, 1981b)

Recognizing that Harmon and King's conclusion cited above, and another statement by Gagne (1977), involve the pragmatic element of time-to-teach as well as the theoretical element of teachability, Silber concludes that "if they **can** be taught to adults, it may require years of practice for them to learn and use a cognitive strategy." (Silber, 1981b)

Taking the opposite view, Wallington (1981) believes that it is theoretically possible to teach the formal operational cognitive strategy to adults if the proper instructional strategies are used. He suggests that formal operations must be taught to students by repeatedly having them solve problems which cannot be solved using concrete referents. He, too, cites Harmon and King (1979) on the procedure involved. To move from a concrete to a formal operational level

> involves overcoming inconsistencies and contradictions that are generated when a student seeks to apply her current repetoire of problem-solving strategies to tasks for which they are insufficient. Thus, to encourage a level change, developmentalists design situations that confuse the student. For a Piagetian, this confusion is a necessary part of the process by which a student reorganizes her/his basic cognitive structures to better deal with the demands of the tasks s/he is confronting. (Harmon and King, 1979)

Wallington believes that it is possible to build this instructional strategy into a training program, and thus move students from concrete-operational to the formal operational level--where they will possess the cognitive strategy underlying ID.

However, on the pragmatic issue of time and resources, Wallington concurs that it **may be impractical** to attempt to teach the required cognitive strategy within our training programs.

To conclude, it is safe to say that the answer to the question "Can the skills be taught?" is ambiguous on the theoretical level; on the pragmatic level the answer is, "It will take a lot of time and resources."

Training Program

If the underlying skills can be taught at all, how can we best go about it?

Gagne and Briggs (1979) explain that the teaching of cognitive strategies is different in nature from the teaching of intellectual skills. While with intellectual skills it is possible to plan a sequence of learning events external to the learner that provide the "sufficient conditions" for insuring the learning of those skills, the situation is more complex with cognitive strategies:

> ...the design of instruction for cognitive strategies has to be done in terms of "favorable conditions," and cannot be accomplished by specifying "sufficient conditions"... Generally, the favorable conditions are those which **provide opportunities for development and use** of cognitive strategies. (Gagne and Briggs, 1979)

Thus, according to Silber (1981b),

> ...if we are to attempt to teach cognitive strategies, it should be not with a course on "creative problem-solving," but rather by incorporating [into all courses that we teach] instructional strategies ...which demand that the student develop and use the problem-solving cognitive strategy underlying ID. (Silber, 1981b)

A more specific plan for teaching the cognitive strategy, in terms of Piaget's Formal Operational Thought, is proposed by Wallington (1981). His proposed instructional strategy is presented in Table 41-4.

It seems that Wallington's proposed incorporation of the instructional strategy into the curriculum provides the "favorable conditions" for the development of the cognitive strategy in students. Whether such an approach would work, and how it would affect the learning of the specific ID skills, are questions which can be answered only through future research.

Screening Students

Due to the ambiguity of the evidence on

Table 41-4. An instructional strategy for teaching formal operations in an ID Program (From Wallington, 1981).

-- over a long period of time, the courses should be structured so there is a progression from concrete operations to formal operations;

-- the skills learned in the courses should be arranged so that even if the content varies from cognitive to affective, or from fact to concept to problem-solving, every higher-level course should have some problem-solving built into it;

-- a program must have more to it than the learning of facts and procedures, because the cumulative effects of a number of concrete operations is **not** necessarily a move up to formal operations;

-- students making the move from concrete to formal operations levels must be given care, and their confusion must be resolved if such resolution is possible for them; **if it is not possible for them to move from concrete to formal operations, even more care and counseling is needed;** and it is the ethical obligation of the program to provide the student with such counseling;

-- all courses should be broken down into skills to be acquired, and these should be examined as to type and level of skill (by **someone's** consistent classification scheme) and then sequenced accordingly--this has special implications for courses outside the regular program.

whether or not the underlying skills can be taught, and to the pragmatic, if not theoretical, difficulty of teaching them if they can be taught, an alternative, but more radical, approach is suggested by Silber (1981b):

> If we cannot teach the internal problem-solving cognitive strategy that underlies ID, then we must use it as **a screening device.** We must only allow into graduate ID programs **those students who already use Formal Operational Thought and who possess the SI Problem-Solving abilities**--the cognitive strategy. (Silber, 1981b)

That such an approach may be an unpopular one is acknowledged by the proposer. He believes, however, that such an approach is better than graduating ID students who possess the specific ID skills but who do not use them well or appropriately because they lack the underlying cognitive strategy.

It should be noted that the use of screening mechanisms for graduate programs is not a new idea. Many institutions training developers currently use GRE and/or Miller Analogy Test scores, English proficiency tests, and undergraduate Grade Point Averages as screening devices. The addition of one more screen to these, or the replacement of the current screens by one which is more relevant to ID, is, in this context, not such a revolutionary idea.

Critique of Underlying-Skills Training Programs

It is difficult to critique a training program which (1) is ambiguous about whether the skills can be taught at all; (2) is based upon "favorable" rather than "sufficient" conditions for teaching the skills; and (3) offers screening as an alternative to training. However, several evaluative points can be made.

First, the underlying-skills approaches are the only ones to even raise the question, "Can the skills be taught?" This is an important question to be asked, regardless of which skills approaches are to be used. Not asking it assumes that everyone can learn to be an instructional developer. This seems to be a naive assumption, and one that is made in very few professional fields; doctors, physicists, clinical psychologists, linguists, and numerous other professionals assume that not everyone can learn the skills required to become a competent practitioner in their fields. Is instructional development so "simple" a field that anyone can learn to practice it well?

Second, the ambiguity--both theoretical and practical--about whether the cognitive strategy underlying ID can be taught to adults must be resolved. While the literature seems to point to the negative answer in both areas, there is still room for further research and a more definitive conclusion. An answer to this question will help in deciding whether efforts should be directed towards the improvement of teaching the skill, or towards its use as a screening device.

Third, the instructional strategy which has been proposed in order to create the "favorable conditions" for learning the underlying cognitive strategy is weak. From a logical point of view, it seems to be the appropriate, and only, way to attempt to teach the internal thought-and-control process underlying ID (at least as specified by Piaget's Formal Operational Thought). However, it needs to be tested in a controlled experimental situation in order to determine if it does indeed work.

Fourth, and finally, the notion of screening students based upon their possession of the cognitive strategy should not be written off as heretical or unethical. Based upon the number of screening mechanisms already used to admit students to ID programs, it is not such a radical idea. It, too, needs to be tested in an experimental situation. Another possibility is the use of test data indicating non-possession of the cognitive strategy as a counselling device--indicating to such students that they do not seem to possess the thought processes required of a developer and that they will probably have a difficult time in the ID field; they could then be permitted to decide for themselves whether or not they want to continue in the ID training program.

FUTURE DIRECTIONS FOR TRAINING DEVELOPERS

This chapter began by identifying the need for specifying the nature of ID training if ID is to become a profession, and by indicating the paucity of literature in the area of the training of developers. It reviewed the "specific ID skills" approaches, discussed their lists of competencies, and examined a typical graduate ID program based upon these specific skills. After indicating some shortcomings of this approach, the chapter briefly reviewed some attempts to add "higher-level skills" to the training of developers, including a discussion of what such skills are and how they might be taught. Noting that deficiencies exist in these approaches, the chapter then turned to the newest set of approaches to ID training--"underlying-skills approaches." It reviewed the nature of these underlying skills, as described by Wallington's "generic skills" and the "internal problem-solving thought-and-control process" suggested by Silber, and as delineated through Piaget's Formal Operational Thought and Guilford's Structure-of-Intellect Problem-Solving factors. Finally, the chapter presented the issues involved in teaching these underlying skills to prospective developers.

What implications for future directions in the training of instructional developers can be drawn from this review?

First, the specific ID skills are important, and must be learned by developers. The efforts involved in the development of a comprehensive, agreed-upon list of competencies, and in using them as the basis for certifying developers, seems to be an important step in assuring that all developers receive adequate training for their profession. It will force improvement in training programs that do not now provide those learning experiences which are necessary for students to attain all the competencies. It will improve the status of ID as a field, and move it in the direction of becoming a profession. Finally, it will insure employers that, when they hire an instructional developer, they will indeed be hiring someone who can apply a set of procedures that--based upon the best knowledge available today--will produce effective instruction.

Second, the higher-level skills are essential for a practitioner to exercise in order to function as an effective developer. Training developers to operate at the "creating" rather than only at the "rule-using" level is crucial if they are to develop instruction which will teach students to create, rather than merely to remember or to use rules.

Third, the underlying-skills approaches present too powerful an idea to be ignored. With their strong founding in psychological theory, their generalizability over a large number of specific situations, their research support, and their delineation through at least two theoretical models, they represent a new, powerful, useful approach to viewing the skills needed by instructional developers.

The author believes that they represent an important quantum leap in the way we view the training of instructional developers, and, as such, they represent the future direction to be taken in the research, theory and practice pertaining to the training of developers.

Our energies as a field should be directed toward validating these underlying skills, exploring the relationships between the theoretical models which describe them and describe the components of the underlying skills as identified by these models. Efforts should be directed toward deciding whether or not these underlying skills can be taught, and if so, how. The notion of screening students based upon their possession of the underlying skills should be addressed.

Only if we can successfully train those who will come after us can the profession of instructional development succeed and prosper. The author believes that the best path towards the improvement of our training of future developers lies in the underlying-skills approaches. We need to answer the questions they pose, refine them into usable forms, and then implement them in ID training programs.

Doing so may cause those of us involved in the training of instructional developers to re-think and re-structure our graduate programs, but the results of this work--improved graduates--will make the effort well worth it.

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Chapter 42

Problems Associated with the Professional Preparation and Certification Of Educational Technology Personnel

Marvin E. Duncan

What is the proper relationship among accreditation, certification and training? What role should feedback play? What about quality control? This chapter attempts to explicate these relationships, and in the process brings into focus the latest developments in the evolution of a certification procedure for educational technologists. Suggestions are also provided for using the data produced during certification to improve the quality of training programs, and for applying similar procedures informally throughout the curriculum.

INTRODUCTION

While curriculum evaluators judge the competencies in students enrolled in programs in educational technology as excellent with respect to theoretical matters many professionals in the area are becoming concerned about the lack of activities requiring practical application of this theory during formal instruction. In fields such as educational technology which require more than the mastery of theory for successful practice, it is desirable that experience in the application of theory be provided the student during the period of formal preparation. Incorporated in the practice of these disciplines is the process of certification,[1] a concept closely related to evaluation and quality control.

In general, quality control is the monitoring of all stages of a process such as a curriculum experience in order to insure that the skills taught in each stage of the learning process have been sufficiently mastered prior to movement to the next stage, thereby providing assurance that expected outcomes (end products) are at or above a pre-set level. Certification is a way of verifying that an individual can perform a task correctly (AVI, 1974); thus it is an official determination of the quality control-training combination. In a sense, certification can be considered to be the final stage in the quality control of the training process. For example, licensing agencies and professional organizations which are associated with the service of "helping" professions, such as medicine, guidance, and counseling, to name three areas, require students to engage in internships prior to becoming certified. Skills exist in all three professions which must be practiced while students are engaged in formal instruction so that those skills which need "honing" can be "honed" under the supervision of a professional practitioner.

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[1] The following definitions will be employed throughout this chapter:

Certification is the process by which an outside agency supplies quality control procedures to the final stage in the preparation of an individual to practice a profession.

Accreditation is the process by which an outside agency applies quality control procedures to a curriculum or group of curricula in order to guarantee the quality of either the curricula or the graduates of the curricula.

Graduation is the final granting of certification by an inside agency, such as a university department, high school or college.

Each of the above may be competency-based or non-competency-based. The type of quality control procedures employed is largely determined by this procedure, and in turn largely determines the effectiveness of the procedure.

This is not to suggest that an instructional program, regardless of its academic soundness, can guarantee that all of its graduates will perform as expected by the institution or the accrediting agency. Nevertheless, accredited programs which incorporate quality controls along with certification requirements can, to a reasonable degree, insure that graduates have been exposed to a sound curriculum with built-in quality controls and can perform at the minimal level of adequacy established by the accrediting agency.

The underlying rationale for certification is the assumption that if a person is certified to perform a task correctly and if the task produces known results, then by certifying that the individual can perform the task, the quality of results is somewhat insured. In an article, "Certification and Accreditation" (AVI, 1974), the author illustrated this idea by stating that:

> The medical doctor may not always be completely successful in the treatment of his patients, but according to the rationale behind licensing, he can carry out procedures beneficial to his patients. The procedures have been tested in the past and have shown results for patients with similar symptoms.

Special significance should not be attached to the medical example except that all of us are aware that the medical treatment does require successful application of theory if the patient is to progress. The underlying assumption is that licensed medical doctors, regardless of the specific source of their academic preparation, can perform basic medical treatment.

Unfortunately, this claim cannot be made about students graduating from the various programs in educational technology; skills possessed by students upon completion of these programs are likely to be as varied as the universities awarding degrees. The purposes of this chapter are to: (1) present a historical perspective on educational technology, (2) discuss problems associated with the professional preparation of media personnel, (3) discuss the current state of certification requirements and (4) suggested guided field experiences or internships. A summary is also provided.

SOME CURSORY REFLECTIONS ON THE HISTORY OF EDUCATIONAL TECHNOLOGY

Educational technology has undergone radical changes since the early days of audiovisual emphasis. In a way, these changes parallel those of the transportation industry. This industry has progressed from travel by land and water, to travel by air; the horse-and-buggy, to trains, to the horseless carriage to the Wright Brothers and their early flights, to jet engines and space flights. Although educational technology has not made progress of this magnitude, progress has been significant. In earlier days, media personnel were "deliverers" of materials and equipment, providing these services without having to meet certification requirements. Educational technologists have progressed from delivering art objects and models, to museums during the early 1900s, to designing instructional systems at the present time. The movement has been from a no-certification requirement towards basic certification requirements.

The audiovisual movement evolved and became a part of the mainstream of instruction circa 1918-1929. For the first time during these years:

(1) Visual instruction courses were offered to teachers for credit at the college and university level;

(2) Professional organizations for visual instruction were founded at national and local levels;

(3) Professional journals in visual instruction appeared;

(4) Systematic research in visual instruction areas was undertaken and reported; and

(5) Administrative units for visual instruction were organized in colleges and universities, public schools and state departments of education (Saettler, 1968).

Visual education or visual instruction were the phrases associated with the new area until 1947, when the Department of Visual Instruction of the National Education Association changed its name to the Department of Audiovisual Instruction. In 1970, a second name change occurred, and the Department of Audiovisual Instruction became the Association for Educational Communications and Technology.

Changes in the name of the organization, i.e., Visual Education, Visual Instruction, Department of Visual Instruction, Department of Audiovisual Instruction, and the Association for Educational Communications and Technology, either directly or indirectly resulted in changing descriptors for media personnel (audiovisual specialists, media specialists, educational technologists, ad infinitum). Courses in audiovisual education were being offered; graduate programs in audiovisual education were initiated at colleges and universities; research in audiovisual education was conducted at a rapid rate during the 1950s and 1960s.

The number of graduate programs in educational technology increased at colleges and universities during the 1970s. Mergers of programs in educational technology with programs in schools of library science occurred frequently. Some colleges and universities still offered separate programs in library science and educational technology. This practice has added to the confusion in the terminology of the period. The presentation which follows is a discussion of some of the problems growing out of this history which are associated with the professional preparation of media personnel and which have implications for certification.

PROBLEMS ASSOCIATED WITH PROFESSIONAL PREPARATION

As mentioned in the preceding section, at many universities the schools of library science and the educational technology program have combined their efforts in the preparation of professional media specialists. At other universities these two programs remain separate, with each program awarding degrees in media. The latter academic practice contributes to a confusion over the different competencies and skills a media specialist can be expected to possess, since individuals who graduate from separate programs are trained in various sets of competencies. This, in turn, makes it more difficult for prospective employers to select a properly trained person for a particular job. School administrators, business and industrial executives, and professional school personnel often consider an individual who received his professional preparation in an educational technology or educational media program and one who received his professional preparation in a library science program as having the same competencies, but this in fact, is not the case. Because of the recent trend towards the housing of the media center in the school library, and the changes in nomenclature relative to media specialists, confusion continues to exist relative to who is a media specialist and what competencies he should possess.

Considerable attention has been devoted to defining the role of the media specialist from varying points of view. No attempt will be made here to add to the already lengthy list of role definitions. However, the writer operationally defines a media specialist as an individual who assists teachers in the selection, preparation, integration, utilization, and evaluation of media in order to extend the learning capabilities of a target audience. Thus, the responsibilities of the specialist extend beyond working with media, i.e., threading projectors, making minor equipment repairs or simply working in a setting where media are stored. Literature describing media personnel and their roles is abundant and provides a multiplicity of job titles. Media personnel suffer, among other things, from the problems associated with an ever increasing list of job titles. Apparently titles are changed in order to keep pace with changes in the roles played by media Personnel. Wynn, (1973) in describing these changes, writes that "this trend from banal to more esoteric job titles has been all about us, even in schools. School librarians have become instructional material center coordinates..." This changing of titles was explained by Wynn (1973) when he wrote that "the esotericism of job titles must be escalated with the rising affluence of society." Audiovisual specialists have evolved into educational technologists with an endless number of descriptors in between. No single group or individual is responsible for the maze in which the field finds itself. All involved in the field are equal partners in the "confusion matrix."

A review of the literature reveals that both the titles "media coordinator" and "media specialist" are frequently used to describe a person who coordinates the use of media. While arguments about this point may seem trite, careful analysis indicates that it compounds existing confusion. In a few states, individuals whose major academic preparation is in library science are certified as "media coordinators." Similarly, those whose major academic preparation is in educational technology or educational media are certified as "media specialists" (in either television, production or instructional development). Failure to recognize the differences in academic preparation of the "media specialist" and the "media coordinator," and differences in competencies and skills developed in their training programs is also a failure to dichotomize the two areas. Without a doubt, there is presently more overlap in the tasks performed by "media specialists" and "media coordinators" than in previous years. Yet, differences still exist. The librarian's changing role is chronicled in part by Wood (1970) who asserted that school librarians, in their roles as "media specialists," must possess competencies in media design, development, and evaluation. There is no question that librarians can function effectively and efficiently in the new role. The paramount concern is that librarians in their new roles be referred to as "media coordinator." Imagine the confusion which would result from calling peaches and nectarines by the same name.

JOINT CERTIFICATION FOR MEDIA PERSONNEL

As mentioned, library programs and media programs have been merged in many colleges and universities. This merger provides students in these programs with similar curricular experiences. Therefore, joint certification for these students does not pose a problem. However, there are library programs and media programs which remain separate and which continue to provide differing curricular experiences. Joint certification for individuals completing these separate programs will create numerous problems. It is unlikely that students from programs with differences in scope and content can take and pass the same certification examination.

In 1975, a questionnaire was administered nationally to 495 school media specialists in an effort to ascertain and assess their judgments and perceptions of the graduate level courses they felt were most appropriate and applicable for training them to manage and operate their school media centers. Among the findings were that:

> Graduate level media programs should offer additional courses in media design and production. Courses that would seem to hold some interest for school media specialists might include (1) advanced media production skills, (2) graphic design and (3) still and motion picture photography (Ball, 1976).

Most library programs which remain separate from educational technology or educational media programs do not offer and probably cannot offer such courses without major curricular and staff additions. These courses are usually offered in educational technology or educational media programs.

Similarly, courses such as storytelling, basic reference materials, and cataloging are recommended by the survey for inclusion in graduate programs in educational technology or educational media. Educational technology or educational media programs which have not combined with library programs probably do not offer or probably could not offer the latter sequence of courses without major curricular or staff additions.

The circumstances noted above appear to suggest a merger of all library and educational technology or educational media programs. However, it is proposed that that merger should take place only when more similarities than differences exist between programs, when the two programs prepare students for similar jobs. A merger of programs should also mean a merger of staff.

The preceding presentation is intended to bring into focus some of the problems associated with preparing media personnel. Mergers of educational technology programs with programs in schools of library science does not present a problem with respect to certification of graduates from these programs. Certifying graduates of separate programs may present a problem. The ultimate concern should be to develop competencies in students which will enable them to obtain and maintain employment and to perform effectively on the job. In reference to certifying students who graduate from separate library and media programs, the following should be considered:

1. Advisors of students majoring in educational technology or educational media should recommend library science to their students as a minor.
2. Advisors of students majoring in library science should recommend educational technology or educational media to their students as a minor.
3. An examination should be designed for those students who graduate with a major in educational technology or educational media and a minor in library science. The major thrust of the examination should be in the area of media.
4. A different examination should be designed for those students majoring in library science with a minor in educational technology or educational media. The major thrust of this examination should be in the area of library science.
5. A separate examination should be designed for those students who graduate with a major in educational technology or educational media who pursue a minor other than library science, and for those who graduate with a major in library science, who pursue a minor other than educational technology or educational media. The thrust of these examinations should depend upon the student's major area of concentration.

Library and media programs which have not combined in their effort to train media personnel are exposing their students to different curricular experiences. These experiences present problems regarding certification. Even should the differences in competencies of "media specialists" and "media coordinators" be clarified, certification examinations still must be designed to reflect these differences. The above should not be taken to mean that the decision to merge library and media programs is unwise. Yet, merger of these programs has implications for certification. Universities which have separate library and media programs are providing students in each area with different curricular experiences and developing in these students different competencies. In any event, those who certify students who graduate from a combined library-media program and students who graduate from separate library and media programs must consider differences in preparation.

The impetus for certification came about as a result of an increased number of advanced programs in audiovisual education. It was proposed at a California audiovisual workshop in 1947 that an audiovisual director must complete either a supervision or administration degree on the elementary or secondary level. Additionally, it was recommended at this workshop that the audiovisual director must complete one course in the administration of audiovisual programs and one course in supervision of instruction and curriculum in audiovisual education (Saettler, 1968).

A more detailed credentials program was recommended in 1951 by a committee of audiovisual directors in Indiana. These recommendations were approved by the Indiana Teacher Training and Licensing Commission. They were subsequently presented to the Committee on Professional Education and a sub-committee of the Department of Audiovisual Instruction (DAVI). In 1952, it was recommended by this sub-committee and approved that DAVI take the following actions:

1. Go on record urging appropriate state

groups to take steps in their individual states to bring about suitable action to establish certification for audiovisual directors.

2. Assist appropriate state groups by supplying them with a suggested pattern of requirements for certification of audiovisual directors.
3. Recommend that experience as an audiovisual director prior to the effective date of certification be counted toward professional course requirements in audiovisual education.
4. Recommend that such state certification requirements become effective within three to five years.

Thus, it was evident in 1952 that planners of curricular experiences for students enrolled in audiovisual education programs were concerned with verifying that appropriate competencies were possessed by media personnel. It was perhaps during this time that the role of the media specialist was changing rapidly. Concern for the preparation of audiovisual or media specialists was shared by the Department of Audiovisual Instruction, as demonstrated by the department's sponsorship of the Professional Education of Media Specialists (or PEMS) Commission, whose task was to study new professional preparation of media personnel. This period also brought with it studies sponsored by the United States Office of Education, numerous textbooks in the field, and a multiplicity of DAVI publications.

CERTIFICATION: WHERE ARE WE?

The 70s was a recapitulation of the 60s with respect to certification and accreditation efforts. In 1971 for example, Robert Heinich, then president of AECT, appointed two task forces. One task force was assigned the responsibility for studying problems pertaining to certification. The other task force was asked to make recommendations regarding problems associated with the accrediting of educational communication and technology programs. The two task forces worked on their respective assignments for approximately three years, sometimes working independently and sometimes in concert. As a result, guidelines were recommended. These guidelines represented a competency-based approach, rather than requiring students to complete a certain number of courses carrying particular titles. In other words, these guidelines attempted to relate accreditation and certification to specific competencies rather than to courses. The initial areas proposed for certification were, media management, media product development, and instructional program development.

Recommendations adopted in 1974 provided guidelines for two levels of complexity or competency; for each of the areas to be certified/technician and specialist. Areas and levels are visualized as a 2 x 3 matrix (AVI, 1974). The area under consideration for certification were media management, media product development, and instructional product development. As will be discussed in detail later, these guidelines continued to evolve, until by 1979 the major area under consideration for certification had become instructional development, media management, and materials design and production. A graphic representation of the 1979 guidelines is presented in Figure 42-1.

Each major area in which certification is contemplated consists of nine sets of competencies:

1. Organization management
2. Personnel management
3. Research and theory
4. Design
5. Production
6. Evaluation and Selection
7. Support and supply
8. Utilization
9. Utilization/dissemination.

The 1974 guidelines indicated that since these competencies could be performed at various levels of difficulty, an individual could be certified at two different levels to be called specialist or

		Major Area of Certification		
		Media Management	Media Product Development	Instructional Program Development
Levels of Complexity	Specialist			
	Technician			

Figure 42-1. Guidelines for 1979.

technician; this bilevel approach has been retained in the 1979 guidelines which now will be examined. The media management area of certification required the technician to have an associate degree, with either three semester hours of supervised practicum, internship or field experience, or with six months of work experience. The specialist in media management must have earned a four year degree, be certified as a teacher, and to have two years of experience in the field.

The media product development technician was required to hold an associate degree with the same experience parameters as those required of the media management specialist. The media product development specialist was required to have two years of experience in media product management, a master's degree and teacher certification. The last level, instructional program development, did not have certification requirements for the technician level but required a doctorate for the specialist, along with three years of teaching experience and two years of experience in instructional program development. Competencies for each area and level are detailed in the November 1974 issue of Audiovisual Instruction.

As previously noted, a certifying agency attempts to determine if an individual can adequately perform specified tasks. Since individuals can be certified in the above three areas, updating the curricula should mean modifying curriculae in such a way as to increase the likelihood that students graduating from these programs can successfully perform those tasks required by the certification guidelines. The accreditation process should in turn, be based upon the establishment of such curricula. (It should be noted at this point the difference between accreditation and certification.) Prigge (1976) points out that accreditation is concerned with the evaluation and approval of programs whereas certification is concerned with the licensing of individuals.

While revisions have been made in these guidelines, major changes have not occurred even though not all of those interested in the matter are satisfied by these guidelines. Evidence of this is provided by the fact that, as late as 1979, annual convention certification was the most frequently discussed topic at the AECT Conference held in New Orleans. Nevertheless, as it now stands, instructional development, media management and materials design and production are to be the areas in which it will be possible to obtain certification.

PRESENT GUIDELINES

As the guidelines have fully emerged, individuals seeking certification must demonstrate competency in the common core area, which consists of competencies in each of the following sub-areas:

1. Professional Development
2. Equipment Operations
3. Instrument Construction
4. Evaluation Methods
5. Needs Assessment
6. Performance Analysis
7. Behavioral Objective Construction
8. Code of Ethics Adherence
9. Public Relations
10. Communication Models
11. Terminology
12. Human Relations
13. Interpret Research
14. Application of Research Findings

In addition, the individual must demonstrate competency in one of the three specialty areas, i.e., instructional development, media management, or materials design and production.[2] In order to obtain certification as an instructional developer and as a manager of instructional development, the individual must demonstrate competencies in each of these areas:

1. Organization - Management
2. Personnel Management
3. Research - Theory
4. Production
5. Design
6. Evaluation/Selection
7. Logistics
8. Utilization/Dissemination.

Areas of competency required for certification in media management include, in addition to the core area, each of the areas listed below:

1. Organization - Management
2. Personnel Management
3. Utilization
4. Research - Theory
5. Evaluation

Certification in the area of Materials design and production will occur on two levels; basic certification, which is the level at which materials are designed and produced, and advanced certification, which includes the management of complex operations and the coordination of groups of individuals and units. Certification in materials design and production will mean that those certified are competent in the core areas listed earlier, and in addition can demonstrate all-around production capabilities in conveying messages via:

1. Graphics and Graphic Arts (include printing and reproduction)
2. Photography
3. Audio Communication and Audio Recording Distribution
4. Cinematography
5. Television
6. Combinations and Derivations of the above.

Present plans call for the competencies in each of the areas to be evaluated using:

1. A Written Examination
2. A Portfolio Examination

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[2] Information excerpted from "Certification," Florida Media Quarterly by Ronald K. Bass and Marvin E. Duncan, Vol. 5, No. 1, Fall 1979.

3. A Practical Examination

Of course, plans are subject to change. However, major changes are not expected to occur in the proposed guidelines as they have outlined here.

Guided Field Experiences

One way of insuring a positive correlation between task performance and certification is to incorporate guided field experiences or internship into the student's learning experiences. This is particularly necessary in areas where the mastery of theory and the application of that theory in practice situations are equally important. There is a dearth of literature which related directly to guided field experiences for students in advanced educational technology programs. There are studies however, which point out the value of internships in other areas. Davies (1962), in writing about internships in Educational Administration, remarked that an internship in administration, like in any other area, is designed to achieve specific objectives. Davies compiled a composite list of objectives after surveying the literature. He found that these objectives fell into three categories: those applicable to the interns, those applicable to the sponsoring field agency, and those applicable to the cooperating agency. The emphasis here is on those objectives which pertain to the intern. The objectives and caveats listed by Davies follow:

1. To enable the intern to develop a more comprehensive view of educational administration.
   The difference between what is taught in the professional schools and what actually occurs in the day-to-day practicing situation sometimes is substantial. The reasons are many: The lag between theory and practice; gaps in the professional curriculum; nuances of operations dealing with real people that are difficult to tell about in the lecture hall; and effects of community pressures for specific changes. These and other extensions of the on-campus part of one's professional preparation come, it is said, by way of the internship.
2. To provide the intern with the experience of carrying real adminstrative responsibility.
   The purpose here is to offer direct experience as a teacher rather than relying on the various experiences of the campus classroom. Much of administration involves action skills. To learn skills, study them, try them, and eliminate incorrect ones, the intern learns how to perfect skills under the application of responsibility.
3. To enable the intern to benefit from lessons learned by the sponsoring administrator during long professional experiences.
4. To provide a testing ground for the beginning educator whereby the adequacy of training, probable success as an administrator and the type of position for which one is best suited can be determined.
   Just as automobile manufacturers need "proving grounds" and "road tests" to check the dependability and performance of their laboratory-designed and factory-built products, so do professional schools need a safety check on their selection and developmental processes. Here is the guidance function of internship. Like the automobile road tests, it assumes the basic soundness of the product. It is pointed primarily at correcting details of design and manufacture -- and estimating the probable market (Davies, 1962).

While these objectives were written for students in educational administration, they appear to be applicable to the broad area of educational technology. For example, students attempting to be certified as instructional developers could learn an invaluable lesson while working with an experienced developer during an internship. Students could learn to:

1. Create an atmosphere of mutual trust with the client. The intern should come to realize that this atmosphere is necessary if he/she is to work successfully with a client. He/she should also learn that confrontations and highly critical behavior should be avoided.
2. Ask probing questions of the client. These questions should lead the client to understand more clearly what has to be done. Answers to these questions should also provide insight with respect to the nature and source of the educational problem.
3. Develop good listening habits and skills. In this regard, the intern will learn to allow the client to do most of the talking, especially in the early stages of curriculum revision. The intern will learn that the client will reveal the real educational problem sooner or later, directly or indirectly.
4. Avoid the use of educational jargon peculiar to the field of instructional development, since teachers may not have this jargon in their functional vocabularies.
5. Value interpersonal communication skills and to realize that face-to-face communication is superior to other forms of communication (Duncan, 1978).
6. Develop a more comprehensive understanding of the nature, scope, and intracacies of the instructional development process. However, by

> becoming directly involved, the student should learn to state instructional problems in a clear and concise manner, become aware of the complexities in identifying instructional problems, analyze instructional objectives in terms of types of learning, match media with objectives, provide alternative solutions to the problem, evaluate the instructional development effort, i.e., strengths and weaknesses of the product based on field testing. This integration of theory and practice during the guided field experience affords the intern a testing ground where theory is utilized in a real-life situation (Bass and Duncan, 1982).

The objectives presented above concern certification for instructional developers. However, the other two areas of certification, i.e., media management and materials design and production also afford students invaluable internship experiences. Students pursuing specialization in materials design and production can learn theory and gain valuable experience during their formal academic preparation. The test of how well this theory and application have been mastered could come during an internship, during which the student would be assigned to work under the supervision of an experienced practitioner.

FEEDBACK, CERTIFICATION AND TRAINING IN MEDIA

The field of educational technology has become saturated with graphic models. These models are designed as guides which illustrate how the instructional development process works and many of these models make use of feedback loops which serve as "monitors" for each stage of the process. The feedback monitoring process has been proposed as an element of certification. Academic programs training instructional technologists would receive information concerning what areas and competencies their graduates were failing in. This would enable them to structure their programs so to correct these deficiencies. Feedback can also be profitably utilized during a a trainee's internship; the school sponsoring the intern would receive information relating competencies the intern was deficient in. Thus the school could correct these deficiencies in their program, if a general pattern were to be detected. If the deficiency were to be found to be peculiar to a particular intern, further work with the intern could be undertaken to correct his deficiencies. As had been advocated by curriculum specialists for years, this process could also be built into the curriculum leading to the internship. As a student progresses through the curriculum, deficiences in competencies the student should have mastered in preceding courses could be identified, and this information could be fed back to those responsible for the appropriate prior courses. Added to the usual summative evaluations conducted at the end of such courses, this would prove to be a powerful tool for curriculum improvement, as well as a strong step toward guaranteeing both curriculum consistency and certification examinations. Such a procedure has long been utilized by industry to ensure a quality end product; here it is known as "quality control."

Monitoring student progress should begin at the entry level and should continue through the guided field experience phase. Without quality control and associated monitoring techniques, both teacher and student could be "missing the boat"; theory and techniques not relevant to the real world could possibly be taught while learning content needed for efficient productivity could be neglected.

Quality control is one way of monitoring results at various stages of the process. "Certification and Accreditation: Introduction to the theme of the month" (1974) included a discussion of quality control and described quality control as a process illustrated thus:

It may be observed from Figure 42-2 that quality control, a monitoring process can be employed at each of the stages of the production sequence. It can be used to monitor the quality of result, to monitor the quality of the process or task which produces the result, or to monitor the quality of the person performing the process which produces the result.

Figure 42-3 illustrates quality control after the performance of the task.

In Figure 42-4, quality control is entered as a measure of the task and not the results. In other words, one is judged on the basis of how well tasks are performed and not by results. An appropriate analogy would be judging a basketball player by form and technique (tasks) and not by results (whether the ball goes through the basket).

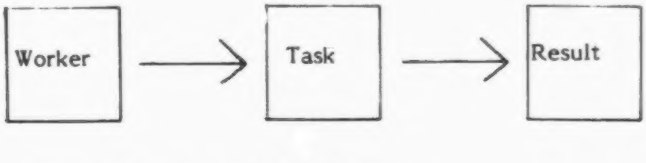

Figure 42-2. The production process.

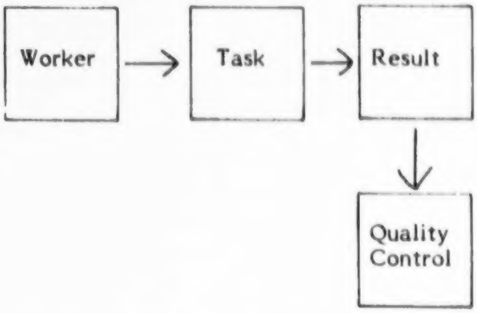

Figure 42-3. Quality control and performance of task.

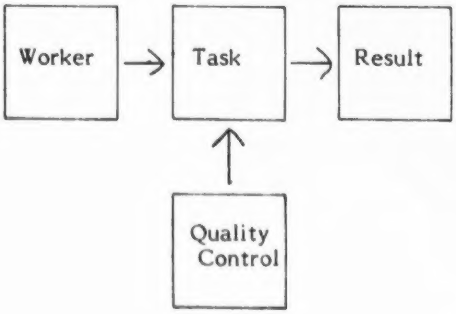

Figure 42-4. Quality control as a measure of the task and not the results.

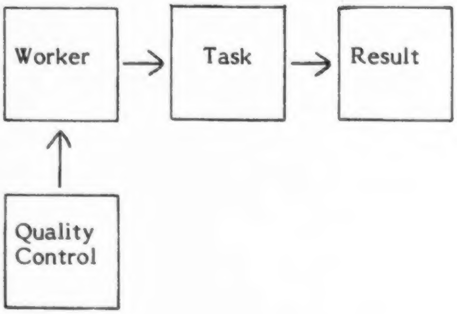

Figure 42-5. Quality control moved further from results.

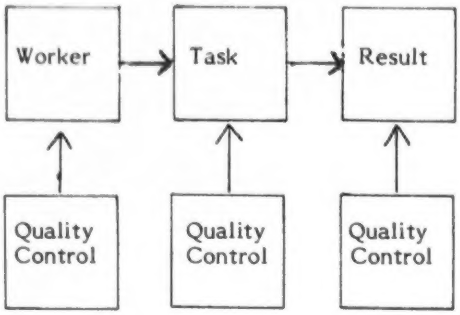

Figure 42-6. Quality control at each step.

Figure 42-4 is a graphic illustration of quality control in relationship to the task rather than to the results.

As shown in Figure 42-5, when all tasks performed cannot be evaluated and observed, quality control is moved further from the results.

> ...the reason for doing so can be quite legitimate. In practice, however, problems arise. For example, some licenses and certificates are for life or are automatically renewable. Further, most licenses are granted on prepractice performance (Audiovisual Instruction, 1974).

Ideally, quality control should be used at each step of the process. Should this be the case, monitoring would take place at each step. This is illustrated in Figure 42-6.

Quality control, it should be noted, can serve two separate but related functions; as a filter and as a feedback device. Both functions are relative to the discussion of certification and accreditation, but so far the discussion has centered upon its use as a feedback device. As a filter, quality control acts as a membrane, or "screen," which has a differential permeability to products, processes or procedures of differing degrees of acceptability, as judged by pre-defined criteria.

The certification procedure has a positive intent: to provide the world with a supply of educational technologists of a known quality. But it also acts as a quality control system, in that it will reject those who are of a lesser quality as measured by pre-determined standards. The rejection is necessary, not only to eliminate questionable products, but also to provide the feedback function to previous stages in the production process. If no one is rejected at the certification stage, no information is obtained for the preceding stage. This dual nature of the process, which is a direct result of the semi-permeable membrane, is a necessary characteristic of the quality control process. However, while the dual function is always present in quality control by its very nature, the use to which the two aspects of quality control are put is not so determined. We have several alternatives facing us, and it is necessary that we be aware of them and make our choice among them deliberately, rather than by happenstance, if the processes of accreditation, certification and the training of educational technologist are to be bound together in a national system of optimal efficiency.

These alternatives depend upon the use to which the two functions of quality control, described above, are put. First, the data gathered in the quality control process may or may not be fed back to those at previous stages. Second, those identified by the quality control process as not meeting the requirements for passsing through the membrane may or may not be rejected. For example, they may be merely identified, and then passed, as often happens in the garment industry, where clothes which do not meet the requirements to be given a certain label are not rejected, but are merely given another label which does not carry with it the same connotations of quality. Or they may be passed unless the failure to meet standards are gross, as viewed by the inspector; such latitude is often exercised, for example, by inspectors in the building construction industry.

Further, since quality control can be exercised at each of the three stages of the production or training process, it becomes possible to employ differing combinations of the two functions at differing points. Thus, in the final stage, certification, one may want to pass everyone and give detailed feedback to the sponsoring school; during the process of training, one may wish to recycle students who are inadequately prepared, and to give feedback information to the program admissions committee. The program admissions committee may wish to reject most applicants, and provide both rejected and accepted applicants with no feedback information at all, (other than notification of results). Accreditation teams may wish to reject no programs at all, but merely to label them according to whether they meet criteria or not, to give each school complete feedback, and to either demand recycling and reexamination; or they may wish to provide this feedback data to all prospective students and employers.

Whatever choices are made, they should be made with full awareness of alternatives; the choices should be made in terms of what purposes the alternatives will accomplish; and they should be made with the goal in mind of welding the accreditation process, the certification process, the training process, and the selection process (both of students for training programs and of graduates for employment) into a system which is efficient, sufficient, flexible, responsive to new data, and humane. The tool for accomplishing this is quality control, and especially the generous use of the feedback aspect of quality control. And it seems unlikely that any other tool exists which can do this. Thus, effective accreditation-training-certification procedures may well be impossible without appropriate decisions concerning their use.

For the first time, the guidelines have provided training institutions a way of updating curricula and a basis upon which to make assessments as to whether or not they were teaching skills specified in the guidelines. In other words, a very definite attempt has been made to establish a positive correlation between performance of a task and certification; how wisely this attempted correlation will be actualized remains to be seen.

SUMMARY

Educational technology has progressed from the infant stage of growth to late adolescence; adulthood remains over the horizon. Media personnel/educational technologists have evolved from being deliverers of materials and equipment with no certification status to designers of instructional systems with certification status. The audiovisual movement became a part of the American mainstream of instruction between 1918-1929 when colleges and universities, public schools and state departments of education began to organize administrative units of visual instruction. The professional organization underwent many name changes; likewise titles associated with media personnel changed from audiovisual specialists to media specialists to educational technologists, ad infinitum. Also significant was the appearance of graduate programs in educational technology at colleges and universities at an increasing rate. Confusion has arisen concerning the competencies which a person with a given title, or from a given school, can be expected to possess.

Numerous programs in educational technology and library science have been combined; others have remained separate, with each program awarding degrees in media. It is the latter practice, the writer feels, which has contributed to the above confusion about which competencies and skills can be expected in individuals who graduate from these programs. In order to deal with this situation, the writer feels that certification regulations should provide certifications for graduates from joint library-media programs, from separate library programs and from separate media programs.

The increased attention being given to certification has resulted from the increased number of advanced programs in audiovisual education. It was evident during the early 1950's that planners of curricular experiences such as the PEMS Commission were concerned with competencies possessed by students of these programs. Two task forces were appointed in 1971 by Robert Heinch, then president of AECT. One task force was assigned the responsibility for studying problems pertaining to certification; the other task force was asked to make recommendations regarding problems associated with the accrediting of educational communication and technology programs. As a result of these efforts, guidelines in these areas were developed. Guidelines adopted in 1974 included two levels for each certification area, i.e., technician and specialist.

The areas under consideration for certification in 1974 were media management, media product development, and instructional product development. The major areas under consideration for certification in 1979 were instructional development, media management and materials design and production. Although the earlier guidelines were revised in 1979, as shown by the areas under consideration, major changes have not taken place.

Certification means that the individual certified can perform specific tasks. In the past, there has not been, necessarily, a correlation between performance of task and certification. The new guidelines attempt to establish a positive correlation between task performance and certification. As mentioned, one way of establishing a positive correlation between performance of task and certification is to incorporate guided field experiences into the student's formal instruction. The value of these experiences cannot be overemphasized. Similarly, the value of establishing quality controls throughout the student's learning experience is of extreme importance. Heuristically, quality control is a procedure for monitoring all stages of a process or a curriculum experience in order to insure that skills in each stage of the learning process have been sufficiently mastered prior to movement to the next stage and thereby providing assurance that expected outcomes (and products) are predictable. This process also provides product quality information which can be fed back to previous points in the system in order to ensure proper regulation of the production process. One phase of this system for self-regulation is curricular revision, and other is accreditation. How this regulation should occur, and how quality control is to be assured in the graduate, are important matters about which we must make intelligent, informed decisions. The need for these decisions comes from the growth of our profession, which is in many ways yet an infant. An infant does not grow without growth pains. There are growth pains all the way from infancy until adulthood. Organizations and academic areas experience similar growth pains, and educational technology is no exception. So where are we, educational technologists, in regards to the certification? We are experiencing growing pains, but at least we are growing, and apparently in the right direction!!

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Chapter 43

Training Instructional Designers at Florida State University

Walter Dick
Robert M. Morgan

Florida State University has a reputation for having an instructional development program with an extremely strong educational psychology orientation. This chapter documents the growth of the ID program at Florida State, reports on current FSU curriculum content, and projects the future of the program.

The preparation of instructional designers* is a relatively new responsibility of higher education. Many of the faculty members who are teaching in such programs have received no formal training in instructional design, but rather have been trained in such related disciplines as psychology, educational psychology and communications. At this time, there is beginning to emerge a consensus concerning the skills and knowledge that trained instructional designers should have.

This paper will describe the experiences of the authors over the past fifteen years as they have participated in the design, development, and implementation of the graduate program in Instructional Design and Development (IDD) at Florida State University. We will use "IDD" to refer to this graduate program.

If at times, it appears to the reader that the authors seem unduly proud of the program, it is because of the successes which have been exhibited by our graduates. However, a deliberate attempt has been made to limit comments which might appear to be self-serving.

The IDD program at Florida State University is recognized for the somewhat unique backgrounds and experiences of the faculty members in the program, as well as the success of its graduates. The program is a reflection of the skills, knowledge, and points-of-view of these faculty members. Therefore, the first section of the paper traces the historical and conceptual roots of the program. It indicates the primary factors which influenced the status of the program today. The second section describes the current master's and doctoral programs in terms of their academic content, procedures and faculty roles. In a brief final section, those features which distinguish the program from others are identified, and a brief look at possible future change in this program is provided.

HISTORICAL ORIGINS OF IDD PROGRAM

No academic program is created instantly; rather it evolves through time and is the product of its origins and other contemporary influences. In order to understand the current IDD program at Florida State University it will be useful to review its beginnings and the conditions which contributed to its growth. In the period immediately following World War II, the Florida State Legislature mandated the shift in both name and function of Florida State College for Women - a small girl's college - to Florida State University. In less than two decades the enrollment grew from around 2,500 students to more than 20,000. Many new colleges and departments were founded during this period, one of which was the Department of Educational Research and Testing. This department was responsible for teaching graduate courses in research methodology, statistics and measurements and, in 1955, was authorized to offer the master's and doctoral degrees in the specialty area of educational research. It had a fairly classical research orientation and was generally recognized as a small but quality program.

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*The term "instructional designer" is used in this chapter as a synonym for the terms "instructional developer" and "instructional systems designer."

In the early sixties, educational research and development throughout the country was subjected to considerable turbulence due to a number of events - Sputnik, the National Defense Education Act, the War on Poverty, and sharply increased criticism of public education. Federal funding for educational research was enormously accelerated during this period. An additional energizing influence at this time was doubtless Skinner's concept of programmed learning. Educational technology began to emerge as a research interest for many professionals who had not previously shown much concern for the problems of education.

It was within this climate of ferment that FSU's Department of Educational Research began to expand its capabilities. In perhaps its first departure from traditional patterns of research activity, the department hired Duncan Hansen from Stanford University, a student of Patrick Suppes, and Walter Dick from HRB-Singer Corporation in 1966. These two brought the department a strong interest in computer-assisted instruction and programmed learning and soon established at this time the CAI laboratory on the campus. The university also established at this time the Division of Instructional Research and Service (DIRS), to which several of the department's faculty members were assigned part-time. DIRS was chartered to channel research knowledge and technology into the improvement of the university's instructional programs. The CAI laboratory and DIRS created environments in which sophisticated, interdisciplinary developmental research could be carried on by the department's faculty and graduate students. As large research projects were undertaken, the need for a wider variety of research and teaching specialties became increasingly apparent.

In 1968, the department added three additional senior faculty members in the area of educational technology and instructional systems. These were R. M. Morgan from the USOE's Bureau of Research, Leslie Briggs from the American Institutes of Research, and Thorwarld Esbensen, Assistant Superintendent of Instruction of the Duluth School System. Morgan was named head of the department at that time. Others who are graduates of programs at Arizona State University (Bob Reiser), Indiana University (Walter Wagner), and the University of Massachusetts (Marcy Perkins) were also employed during the next decade and continue to serve on the faculty. As staff were added, the variety of graduate course offerings expanded, reflecting the interests of the new faculty members and the programmatic needs of the IDD program. In addition to the younger faculty members, R. M. Gagne, Robert Branson, Roger Kaufman and Ernest Burkman joined the IDD faculty as full professors, and this provided a comprehensive and balanced range of specialties.

From 1968 through 1973, the Educational Research Department's faculty grew from eleven to thirty-five, about half of whom were in the IDD program area, and the resident graduate students increased from fifty to over two hundred. External contract and grant funding during this five-year period showed a similar growth rate. In 1971, the department created the Center for Educational Technology to facilitate the management of its project research activities.

Florida State University was not the only university during this time to begin to build an institutional capability in instructional design. The late Jim Finn of the University of Southern California, Ole Larsen of Indiana University, and Charles Schuller at Michigan State University were also expanding their programs in this direction. A difference between these efforts and those of Florida State University's was the academic foundation upon which the "systems" programs were being developed. Many of these new programs were incorporated into academic programs which were historically media or audiovisual in orientation, while at Florida State University the academic base was a research department. These differing origins have doubtless contributed to the variance in the emphases and in the strengths of these several programs. It is interesting to note that, perhaps, the earliest call for what had become IDD was made by Charles F. Hoban in his 1956 Lake Okoboji keynote address entitled "A Systems Approach to Audio-Visual Communication."

FIRST PROGRAM EVALUATION AND REVISION

By the mid-seventies the IDD program at Florida State University was fairly well established. It had simply grown with people and courses being added as needs became evident and resources became available. Generally, this growth occurred in a rational, non-empirical way. There was little or no systematic needs-assessment or front-end analysis--techniques devoutly espoused, even though at times casually practiced by the faculty. Generally, Florida State University's progam and the systems discipline it promoted represented a convergence of three older and well-established disciplines: behavioral science, communications, and management science. The faculty accepted the success of its master's and doctoral students as at least partial validation of the academic program it had conceived. The graduates were readily employable in prestigious institutions and into positions of responsibility.

There was a reorganization of the College of Education in 1973 which had neither beneficial nor adverse long-range effects upon the IDD program. It is mentioned here because it caused the faculty to undertake an extensive reexamination of the master's and doctoral programs. With a fairly large number of graduates by then working in the field, it was possible, by surveying and interviewing them, to determine the congruence between the degree training requirements and the competencies that the graduates actually needed on the job. This study represented a first mid-course revision of the graduate training program based upon empirical data.

The first step in the analysis was to determine the kinds of professional positions the graduates were occupying. The data, when gathered, was somewhat surprising and enlightening to the faculty. There was a much greater diversity of employment than had been expected, and graduates were found working in industrial and military training, international organizations, foreign governments, and research organizations and foundations. Of course, many graduates were working in universities and in public education. From this information the faculty identified and described nine career fields which seemed to offer opportunities for the IDD graduate. These fields are listed and described below:

1. **R & D Organization.** Design, development, evaluation, and research instructional materials and delivery systems. Projects are likely to require originality in many aspects of design. Organizations typically seek funding of projects or proposals which may be unsolicited or in response to published requests (RFP's). Positions may be located in regional laboratories, independent R & D firms, specialized sections of industrial concerns, university or school systems research centers.

2. **Instructional Development Bureau.** Cooperative development and evaluation and course models. Provide consulting services to faculty members in a variety of subject-matter fields, and design new courses and programs, including those utilizing media in new ways. Typical settings for such positions are in universities, four-year colleges, junior colleges, community colleges.

3. **Teacher Education.** Designing, developing, and evaluating educational systems for teacher (and other personnel) education; revising existing programs or program segments; identifying and developing materials; specifying competency for educational personnel and designing performance assessment procedures; developing management systems for teacher education programs. The setting for this type of position is the college of education, state-operated teacher centers, or the teacher education center of a large school system.

4. **Medical and Professional School Education Design.** Design, development, and evaluation of new courses and programs, using a variety of media. Consultation with professors on design and evaluation techniques. Development frequently involves use of the computer. Initiating and managing projects for new instructional design is often expected. R & D activities are conducted in medical schools, allied health professional schools, or other professional schools. Usually such schools place strong emphasis on the tutorial approach to the instruction.

5. **R & D Management.** Planning and managing programs of in-house research, development, and evaluation; and similar programs undertaken by contracts. Such positions usually require a broad knowledge of the field and/or workers in the field. Formulation of broadly stated plans is an important element, as is systematic and fair decision-making involving panels of experts, referees, etc. Budgeting and financial management of a program designed to meet organizational goals is essential. The work is done in offices of education, both state and federal. Employment possibilities also exist in private foundations.

6. **Military/Industrial Training Development.** Design, development, and evaluation of training courses in programs for military personnel (enlisted and officer), or for various categories of industrial employees. Design and evaluation of programs for the education of training managers and instructors; development of handbooks and other materials for such education. The development often involves human-factors knowledge related to man-machine tasks and to the use of simulator and training devices. Location may be in the field station of a military training command, or in a headquarters. In industrial organizations, the work may be conducted in a branch or in company headquarters.

7. **Learning Industry.** Planning, designing, and developing instructional materials in the form of textbooks, teaching manuals, student kits, instructional modules, workbooks, PI materials, films, slides, readiness and achievement tests, and related projects. Coordinates efforts of authors, designers, and producers. Formative evaluation often involved. Work is done for commercial organizations (publishers and related firms), usually with sales of products for profit as a goal.

8. **Curriculum Design and Development.** Development of new programs of study ("curricula") in specific areas, such as elementary science, high school English, etc. Such development efforts typically have expected funding commitments of five or more years; funding may be from national, state, or local agencies. The entire range of design, development, diffusion, and evaluation efforts are typically involved. System planning is of critical importance including marketing and utilization of products. Activities may be carried out in universities, independent agencies, or in large school systems. In the latter location, initial emphasis on evaluation sometimes leads to

subsequent new development, and the continuation of a cycle of innovation.

9. **Instructional Research Departments (in Universities).** Teaching courses, seminars, and workshops in various areas of instructional systems design and development, including the development of instructional materials and all other components required. Directs and manages research and development projects; conducts research on development process. This work of the university professor covers the entire range of systems design and development, and requires research expertise in selected areas. The setting is typically a university department of educational research, educational psychology, or instructional design.

An examination of these career fields reveals a sizeable overlap in specific job functions but also some considerable variation in other functions. When the job functions were translated into specific competencies, two things became apparent. First, not all jobs required all competencies, though there were a sizeable number of competencies which seemed to be essential to all, or nearly all, of the career fields. These common competencies defined the core training requirements for the program. Second, for many of the competencies differing levels of proficiency were required, depending upon the particular career field. The levels of competence ranged from having a conceptual knowledge or awareness, at the minimum level, to having genuine functional expertise in the competency, at the maximum level.

At this stage in the study, the competencies were classified into 16 general categories which included such specialty areas as data handling and statistics, needs analysis, goal definition, describing instructional objectives, instructional materials development, and student assessment procedures. The development of this extensive inventory of job competencies permitted the faculty to examine the course offerings and other training modalities to determine if and where the competencies should be acquired by the student and to what level of proficiency. This exercise revealed a number of things about the program, not the least of which were skills which were not being taught anywhere or were not taught to a sufficiently high level of proficiency. Conversely, we discovered several competencies which were being taught and retaught in numerous courses, resulting in needless and wasteful overlap in course content. As a consequence it was possible to rework the graduate curricula, both adding and deleting courses, and revising content within courses. This was a fairly tedious and sometimes tension-inducing process, as a balance had to be maintained between the theoretical and academic expectations of a program leading to the doctoral degree and the real-world, practical requirements of preparing people for professional jobs.

During the period from 1966 through 1974, the university clearly regarded the development of this new program as a priority. New positions, budgets, and other resources were more than adequate to nurture the growth of the IDD program. However, there was a fairly large turnover of younger faculty during these years. As Florida State University's program became more visible nationally, many young faculty members were recruited away by other institutions and agencies. The senior faculty, however, has been stable, with only one full professor leaving the department since 1966 (Esbensen returned to Minnesota to become dean of a college of education). In 1974, the Division of Instructional Research and Service and the Center for Educational Technology were merged to form the Learning Systems Institute (LSI), a university-wide educational R & D organization. LSI serves both the faculty and students as virtually an adjunct laboratory to the IDD academic program, and its existence contributes significantly to the strengths of the graduate training activities.

CONTINUING PROGRAM DEVELOPMENT

Five years after the 1973 curriculum planning effort, the faculty undertook another analysis of the placement and activities of the IDD graduates. In a survey, the former students in the program were asked how important various competencies were in their work and how important they would be in the future. In addition, ten representative doctoral graduates were invited to campus for a two-day seminar which focussed upon their assessment of the graduate program, the competencies required in their career fields, and their assessments of the requirements for instructional designers in their fields in the future.

With the data from the graduates on their perceptions of the effectiveness of the IDD program, the faculty began their review and revision of the curriculum. This process began, as it did in 1973, with a reconsideration of the career fields which the graduates were entering. While it was found that there were slight changes in employment patterns in 1980, there were relatively few changes from the list of potential employers identified in 1973. It was basically found that some graduates were working as university faculty members, while others were working as members of instructional improvement agencies within a university or as research associates on funded university projects. A few were working in the curriculum divisions of school systems or in government education agencies such as departments of education. A large number were working for the military, industrial training companies or private consulting firms. A few were working in research and development centers or in product development centers.

The data from the alumni indicated that, somewhat to the surprise of the faculty, over 40% of the graduates at the Ph.D. level were employed, with or without academic rank, by colleges and universities. The next largest employer was industry. The rest of the graduates were scattered among military, private consulting, state and federal government, public schools, medical schools, and foreign governments.

Based upon the data from the survey, it appears that the major functions that the graduates are carrying out are: teaching, research, materials development, staff development, and managing projects. It is also noted that graduates serve both as team members and as managers of the various materials development projects upon which they are working.

Based upon this information, seven major areas of emphasis were identified for the revised graduate program in IDD. These emphases are:

1. Design and implementation of instructional systems
2. Development of instructional materials
3. Analysis of media
4. Management of instructional projects
5. Psychological factors in instruction
6. Models of instructional design
7. Trends and issues in instructional design

These areas represent a slight shift from the areas of emphasis in the prior (1973) curriculum. In particular, there is a renewed emphasis upon the overall design of instructional systems as well as upon the more specific skills required to design, develop, and evaluate instructional materials. There is an enhanced emphasis upon management skills, which graduates indicate are required in almost all employment situations. A third area of enhanced interest is that of the psychological foundations upon which the area of instructional design is based. This includes a knowledge of a variety of approaches to the instructional design process which should be available to the instructional designer. These skills are tied to a knowledge of the historical background and current issues in the field of instructional design.

An area of interest not included above is that of research skills. However, it is expected that all graduates will develop skills necessary to conduct an innovative dissertation study and to be a knowledgeable consumer and producer in the area of research in instructional design. The basic courses in research, statistics and measurement are not offered by the instructional design faculty, and will only be briefly noted in the section that follows. In the following section each of the areas of emphasis is examined in some detail to indicate the kinds of competencies which are developed by students in the graduate program.

MAJOR COMPETENCY AREAS

The seven major competency areas within the IDD program are reviewed in this section. These areas form the core program in the doctoral program as implemented in the Fall of 1981. For each area there is a description of the goals and objectives for the basic core courses as well as, when appropriate, a description of some of the optional advanced courses which are also offered in that area. While these are basically courses for the doctoral program, master's students will be taking some of them. (The master's program is described in some detail in a later section.)

"Design of Instructional Systems." This core course focuses upon the procedure employed in the development of total instructional systems, including needs assessment, goals definition, constraint analysis, project design, evaluation and implementation. The overall course goal is for students to be able to describe the principal steps in the design of an instructional system, to be able to indicate how each step may be accomplished, to describe the principal theoretical and research bases for these steps, and to describe how to solve a specified instructional problem in a specified organizational setting. Students develop an integrated, coherent plan for designing, conducting, and managing a systems design effort.

The advanced courses in this area include "Needs Assessment of Instructional Planning." This course investigates the planning and execution of various models of needs assessment and the examination of the research literature in this area. Also included is "Case Studies in Instructional Systems." This course emphasizes a study of different instructional delivery systems: their development, implementation, and evaluation. The course, "Instructional Systems in Practice," will consist of an analysis of various settings in which instructional systems have been implemented and includes strategies for dealing with constraints and barriers to the implementation of instructional systems.

"Instructional Materials Development and Evaluation." This core course emphasizes the procedures for the design and development of instruction which is deemed to be a solution to a student-selected instructional problem. The course includes the design of an instructional product, development of it in a print format, and its formative evaluation and revision. The general objectives for students are to be able to:

1. write a set of instructional objectives for an instructional goal,
2. conduct instructional task analysis for a set of objectives,
3. develop assessment instruments for a set of objectives,
4. develop an instructional strategy, including the selection of media for a set of objectives,
5. write the script for an instructional sequence,
6. conduct formative evaluation and revision of the instructional sequence.

Additional courses in this area includes "Analysis Techniques for Instruction," which teaches the methods of analysis for the derivation of instructional requirements through examples of job, task, and content analysis. Also offered is a course on "Advanced Topics in Instructional Evaluation" which will draw upon current research literature on the formative and summative evaluation of instructional systems. A "Special Seminar on Advanced Topics in Instructional Systems" is offered on an as-needed basis to deal with topics which are timely.

"Analysis of Instructional Media." This core course provides an introduction to the processes and products of educational media development through the study of hardware components, evaluation criteria, and production requirements. The development of production competencies is not the goal of this course. These competencies are developed in advanced courses. Rather, the general goal is for students to develop a general knowledge of the processes and products of educational media development, including the specific ability to:

1. Specify the hardware components and procedures of production applicable to graphics, audiovisual, and computer production;
2. Evaluate media by critiquing products through the application of criteria in such areas as printed text, projected graphics, audiotape, video, etc.;
3. Communicate requirements for the nature and quality of products for a given application, including their costs and production times.

It is anticipated that students who complete this course will choose media products and production techniques which are appropriate to the time, effort, work precision, and costs which are involved in such efforts. Advanced courses in production which will be available to students in the program include "Instructional Television," "Text and Illustrated Materials," "Graphic Design and Advanced Photography," "Computer Courseware Development," and "Multimedia Production." Individual doctoral students typically take one or two of these advance courses. (Students with master's degrees in media may choose to take no advanced courses in this area.)

"Managing Instructional Development." This core course emphasizes management procedures used in instructional development projects, including specific aspects of project management, organizational development, policy formation, staff development, marketing, and dissemination. This new area in the core stresses student knowledge of organizational theory and its application to instructional development organizations, as well as the application of human relations skills required for successful project management in a variety of typical instructional design settings.

"Theories and Models of Instructional Design." Two core courses will be offered in this area. The first emphasizes the application of the ideas of prominent contemporary theorists such as Gagne, Skinner, Ausubel, and Bruner to instructional design. Theories of learning, cognition and information processing are emphasized.

In a second course, models of instructional design and delivery are studied with a focus upon the empirical and conceptual basis of a variety of current models of instruction. In addition, the interservice Instructional Systems Development (ISD) model, models used by various companies, as well as non-systematic approaches to instruction, are also considered.

"Trends and Issues in Instructional Design." This broad heading is intended to provide an overview of the field of instructional design, including historical background, research foundations, current issues and future trends in the field. The professional aspects of being an instructional designer will also be emphasized in terms of ethics and the role of the designer in professional organizations.

The areas listed above provide the foundation for the IDD doctoral program. One additional competency area reaquired of all students is that of research. All students are required to take descriptive and inferential statistics courses as well as one or more courses in the area of research design. In addition, a number of research courses are offered within the instructional design program itself. These courses emphasize the procedures and techniques employed in conducting instructional research as well as the in-depth analysis of instructional problems prior to the formulation of a research problem.

An advanced course is also offered in which non-experimental techniques for researching instructional problems are explored. This includes evaluation and policy analysis techniques, as well as case study and other approaches which are appropriate for advancing knowledge in the field of instructional design.

PROGRAM PROCEDURES

The basic procedures required for the completion of the master's and doctoral degrees in IDD are described in this section. Also included is a brief description of the typical roles of faculty members in the academic program. However, before describing the procedures and roles, it is important to note the distinction between the master's and the doctoral programs in IDD.

In the revised curriculum which is being implemented in the eighties, the faculty have attempted to blend the skills required for research and scholarship in the field of instructional design with the skills required of the practitioner to implement and manage ongoing instructional development activities. These two thrusts co-exist within the program, and doctoral students are provided the opportunity to specialize in either of the two basic approaches to the field. The faculty is convinced that the doctoral program must go beyond instructional design skills and include specialty orientations which are based upon advanced courses in the major competency areas which have been described in the preceding section. In essence, instructional design skills are absolutely necessary, but not sufficient, to define a Ph.D. program in IDD. Students are required to take core and specialty courses along with the dissertation, requiring from two to three years of academic work to complete their doctoral program.

The skills which were often seen as the exclusive domain of the doctoral program in the area of instructional design, are not the major components of the master's program. The faculty now views the function of the master's degree program as that of training the practitioner who will become deeply involved as a productive member of an instructional development team. It is important that a person have the basic instructional design skills and some initial experience before joining an ongoing instructional development project. The master's requires 32 semester hours or about one academic year of credit. No thesis is required for the completion of that degree.

Doctoral Program Procedures. The statewide requirements for admission to graduate study in Florida public institutions is either a grade-point average of 3.0 or better on the last two years of undergraduate study or a Graduate Record Examination total score of 1,000 or greater on the quantitative and verbal sections of that test. On some occasions, it is possible to use the fact that a person has received a master's degree from a recognized institution of higher learning as qualifying that person for admission to a doctoral program. These are, however, minimal admissions standards, and the overall quality of the applicant's academic record, as well as recommendations, are given considerable weight in determining admission to the program.

Upon admission to the IDD doctoral program at Florida State University, each student is assigned a temporary advisor who will work with her/him for an initial period of study in selecting appropriate courses. A faculty qualifying review is held during the students' first year of doctoral study to consider the progress of the student and to determine whether, based upon the evidence to date, s/he is qualified for continuation in the doctoral program. (Note that no written examination is required of the student at this point in the program.)

Following the qualifying review by the faculty, the students who are qualified are then eligible to select major professors and doctoral committees, and to begin the development of complete "programs of study." The "program of study" is a written document which indicates the academic activities in which a student will participate in order to complete the doctoral program. This listing includes core courses, specialty courses and internships which are required in the program.

Each doctoral student is required to take three internships, each of which is roughly equivalent to a two semester-hour course. Internships are typically one semester in length and take place in a research-and-development organization on the Florida State University campus or in the Tallahassee area. The intent is to provide the student with experience in working with a number of organizations, and in understanding the nature of the problems and procedures in these organizations. Several students have in recent years engaged in off-campus, long-term (six month) internships with industrial organizations. It would appear that there is continuing interest in this type of internship activity, which typically includes a salary for the participating student.

Many doctoral students are supported through assistantships which are available both from state funds and from grant and contract funds. Assistantships typically require fifteen to twenty hours of work per week from the student who is also taking twelve to fifteen hours of courses. Nearly all students are full-time participants in the doctoral program since the residency rule requires that all doctoral students complete at least two semesters of full-time campus study.

Following substantial completion of the activities described on the "program of study," the student takes the preliminary examination which is the culmination of her/his coursework activity. The examination is developed by the student's individual committee members and typically includes four questions, each of which requires approximately eight hours of "open book" writing by the student. Some sections of the examination can also be "closed-book." This examination is followed by an oral examination of the candidate.

Successful completion of the preliminary examination qualifies the student to begin work on the doctoral dissertation. The type of dissertation study which will be accepted by the faculty in instructional design has slowly changed over the past ten years. Initially, it was almost always mandatory for a student to complete an experimental, data-based study. While the faculty still requires a data-based study, there is now more of an acceptance of dissertations which include greater developmental and evaluation emphases, as opposed to a purely experimental focus. Completion of the dissertation and of an oral defense results in the awarding of the Ph.D. in IDD. (No Ed.D. is offered by the program or the department.)

Procedures for Master's Program. The admission criteria for the master's program are identical to those for the doctoral program. Once admitted, a student is immediately assigned an advisor who will serve as a major professor unless there is a significant reason to change. Because the master's program is typically completed in one year, the timely selection of courses is often critical. The master's program in IDD has, in the past, had no required courses but, rather, it was left to the student and the faculty member to determine those courses which would be most applicable to the student's career goals. The student was required to take one internship and often held an assistantship. With the new semester system curriculum, the master's program is more structured to insure that all students get the basic courses in instructional design, and that they develop the full array of skills which will be valuable for their participation in instructional design projects.

During the final quarter of enrollment, the master's student takes a comprehensive examination which is prepared by her/his committee. Typically this is an open-book exam which includes three questions, each of which requires approximately four hours to answer. The written examination is then followed by an oral examination, the successful completion of which results in the awarding of the M.S. degree. Approximately twenty-five percent of the master's graduates continue into the doctoral program.

The descriptions of the doctoral and master's programs in IDD at Florida State University are not totally unlike other instructional design programs. What tends to distinguish these programs from others is: (1) the focus of the courses upon instructional design skills, (2) the variety of advanced courses which are offered each semester, (3) the practical experiences which are available to students in the form of assistantships, and (4) a variety of centers and projects which are available for internships.

Faculty Roles. While there is no such thing as a "typical" faculty member, we will attempt to describe some of the functions carried out by the faculty in the program. The most obvious responsibility for all the faculty is to teach in the doctoral and master's programs. Almost no faculty members teach at the undergraduate level, although occasionally a faculty member will assist with educational psychology or media courses for undergraduates.

With the semester system, full-time faculty members typically teach both core courses and specialty courses. Since the core courses are team taught, faculty loads from semester to semester typically include one core course and one specialty course.

Each faculty member also serves as a temporary advisor for several new doctoral students as well as major professor for three to eight doctoral candidates. A faculty member might also serve on fifteen to thirty other graduate committees including major professorship or committee member for master's students.

The typical faculty member also serves on a number of committees in the university. Some of the most important of these are those at the program level in which substantive plans are made for new courses and regulations. The department (as contrasted with the program) has important governance and admissions committees upon which program faculty members must serve. The college and university committees offer other opportunities for the faculty member to interact with colleagues and to provide service at those levels. In addition, some faculty members are officers in state and national organizations, which require them to expend much time and effort.

Each faculty member is also typically engaged in productive research and development activities. These activities often take the form of externally-funded projects. The funded projects provide the critical resources for the faculty member to demonstrate creative contributions to the field of instructional design and to provide employment for graduate students in the master's and doctoral program.

The faculty role description usually indicates the participation of the faculty member in one or more consulting activities with external organizations. Faculty members have worked with schools and state departments of education as well as industry, military and international organizations.

These activities of the faculty, namely teaching, advising, researching and consulting, interact with each other so as to provide them with a broad, comprehensive overview of the instructional design field and the ability to teach specific skills which can be applied in the field.

MAJOR PROGRAM FEATURES

Preceding sections of this chapter have described the historical background and the current nature of the IDD program at Florida State University. In this section, we would like to point out those features of the overall program which we believe distinguish it from the various instructional design programs which exist today in other academic institutions. These observations will be summarized in terms of the faculty, the academic program, and the academic organization. We will conclude with comments concerning the future of the program itself.

The Faculty. Ten faculty members have their major academic appointment in the IDD program. It should be noted, however, that in addition, there are three (3) faculty members in the area of media education and approximately eleven (11) others in the area of research design, measurement and evaluation who are in the same department as the IDD program and offer courses that are integral to the IDD program. The importance of the number of faculty members who are available becomes apparent when curriculum planning is undertaken. The number of available faculty members form a critical mass of teachers who can offer a variety of courses in the instructional design area. This in-depth approach to the curriculum prevents the offering of superficial courses which can only touch the surface of a great variety of topics, and offers the students the perspectives of a wide number of faculty members.

The faculty members presently participating in the program have a variety of academic backgrounds, all of which tend to focus on a behavioral approach to learning and instruction. The majority of the faculty members have received their doctoral degrees in either psychology or educational psychology, while others have received training in science education and communications. The younger faculty members have been trained in educational or instructional technology departments. The faculty members have been trained at such institutions as Ohio State University, Pennsylvania State University, University of Michigan, Indiana University, University of Massachusetts, Brown University, New York University, and Arizona State University.

The faculty members who have participated in the program have been carefully selected because of their range of professional interests. These interests include topics which are both theoretical and applied. Products of these interests have ranged from Gagne's *Conditions of Learning* to Burkman's *ISCS and ISIS Science Curricula* for junior and senior high school students. Research interests range from cognitive psychology to the conduct of needs assessments with vocational education teachers. These interests are expressed with a variety of clients with whom the faculty work. These clients include the other faculty members on the Florida State University campus, the Florida Department of Education, the National Science Foundation, the National Institute of Education, the Agency for International Development, and the Organization of American States. In addition, a number of projects have been conducted with a variety of military organizations, and the faculty members often consult with various industrial or commercial organizations.

The Curriculum. The major focus in the academic program is on the instructional design process. Above all else, master's and doctoral students are trained to design, develop and evaluate instructional systems. Students receive a behavioral orientation both in terms of a theoretical background and applied skills for the development of such instruction.

A secondary level of emphasis within the program is the development of management skills and familiarity with the variety of hardware devices which is available to mediate instruction. However, neither of these two areas serves as the major emphasis in individual student programs. In addition, it should be noted that there is no specific content interest, such as public school topics or vocational education topics, within the program. Nor is there an emphasis upon the training of a particular type of learner, such as a public school child or a military employee. It is assumed that the students in the program are prepared to work with a variety of content areas and learners.

Another important characteristic of the academic program is the variety of backgrounds which the students bring to the program. There have been carefully screened groups from Latin America which have been sponsored by the Organization of American States, as well as individuals who have been sponsored by the Agency for International Development. In addition, the United States Army and Coast Guard have sent students on special assignment to the program, as have the Australian Army and Navy. Many public school teachers and community college teachers have come to the program to upgrade their skills or to develop entirely new career fields for themselves. Recent graduates in psychology and sociology as well as graduates in education find the instructional design program to be an era of great applied interest to them. While there have been relatively few students who have entered the program from industry, graduates often seek jobs in industry.

Organization. Two aspects of the academic organization are important features of the program. The first is that the IDD program is part of a larger academic department in the College of Education. The department in which the program is housed, as noted in the first section of this paper, is the Department of Educational Research, Development and Foundations. The department standards and expectations are established by a faculty of thirty-five members which includes those who teach research design, statistics, measurement, evaluation, international development, sociology of education, educational psychology, and media, as well as instructional design. This intellectual atmosphere is conducive to maintaining high standards of performance and productivity by the faculty.

Another important characteristic of the program is that it is not required to provide ID or media services to the university. While media services and instructional design are available on the Florida State University campus, some of which is provided by the IDD faculty, the responsibility for that service is not that of the College of Education nor of the IDD program. Therefore, the faculty is free to focus upon the teaching, the research and the development functions of the academic program, and various selected service activities.

THE FUTURE

There is a constructive tension in the program between theoretical concerns and the solving of problems of the real world. This tension causes the faculty to continually examine the balance in the program between the two ends of the continuum. This balance is a concern as the faculty plans the program and looks at the career fields that graduates will enter. It is a concern as the faculty plans research and development activities and considers the various service opportunities which are available to them. Each faculty member decides, based upon his/her abilities and opportunities, how to maintain this balance in her/his own work and consequently, the overall balance within the program.

As we enter the eighties, the faculty looks forward to a continually changing and improved curriculum, the attraction of highly qualified and motivated students, the continuing development of young faculty members, and the continuing opportunity to work on the cutting edge of the field of instructional design - a field which many of the faculty have themselves helped to originate and nurture.

Chapter 44

Professional Education in Instructional Development at Michigan State University

Kent L. Gustafson
Charles F. Schuller

Michigan State University has a reputation for being a school which has a very strong educational media orientation for its instructional development program. This chapter chronicles the growth of the program at MSU, describes the current state of the program, and lays out future prospectives for the program.

PART I
THE PAST—HOW WE CAME INTO BEING AND DEVELOPED INTO WHAT WE ARE

MSU AV Center Establishment, 1952

The Audio-Visual Center at Michigan State University came about as a result of faculty demand. The Basic College, one of the more progressive units of the institution, appointed a committee in 1949 to study the matter of needed audiovisual services. Within a year, a university-wide committee was appointed by Dr. William Combs, Assistant to the President and Dean of the University Services Division (which then included the Library, the University Museum and several other agencies). The latter committee found some difficulty in agreeing upon exactly the kinds of services to be provided--other than a campus projection service and a graphics production service. They eventually agreed to bring in a professional director and charge him with the responsibility of planning and implementing the development of AV services for the university as a whole. The co-author of this chapter, Charles F. Schuller, of AV Services, assumed this position as of February 1, 1972, moving from his former position as Assistant Director of the Bureau of Visual Instruction at the University of Wisconsin.

At that time at MSU there were several hundred 16mm films for distribution to Agriculture Extension Agents, housed in Information Services, plus a few small collections of films in perhaps a half dozen university departments around campus. Projection services were provided through the Electric Shop, where perhaps eight or ten 16-mm projectors were housed and maintained. When a department wanted a film shown they had to pay an electrician to bring in a projector and run it.

At the outset, Dr. Schuller had indicated interest in the position only if faculty rank in the College of Education were provided, along with an opportunity to teach audiovisual courses. He also found agreement in the Committee that the underlying function of the Audiovisual Center would be to improve instruction in the University. Though what this meant specifically was not too clear, it could not be argued with and served as a philosophical basis for much later development. In short, the underlying function of the Audiovisual Center from the beginning was understood to be more than just that of a "service" department.

At the Director's request, an Advisory Committee to the Audiovisual Center was formed early on, consisting of a number of members of the original committees and widely representative of the colleges and departments of the university. This Committee met regularly for a time to discuss plans and matters of policy relative to long-range planning, the establishment of the film library to serve the university and schools in the state, and the establishment of a graphics section. Besides being interested and helpful to a new director seeking their counsel, the committee members served an excellent communications function, feeding information back into their respective departments and to the administration of the university.

After two or three years, once a sound program had been started, and after discussing the matter individually with all of its members, the Advisory Committee was officially discharged. While this termination could have been interpreted negatively, such was not the case. By that time most policies and plans had been well established along with a mutual feeling of confidence between the Director and members of the Committee. Furthermore, most members of the Committee were senior professors or administrators and all had numerous other committee assignments. Accordingly, they were pleased at being relieved of further direct responsibility--particularly since most such committees usually continue ad-infinitum. Furthermore, the Director continued to consult with several of the former members from time to time when steps of significance were under consideration.

During the first several years of its existence, the AV Center increased its staff and equipment for campus services, established a graphics section, and laid the groundwork for establishing a film library. The film library took a year or two of careful planning and persuasion. The fact that the State of Michigan, with two and a half times the population of Wisconsin, had something less than half of the film library capacity then existing at the University of Wisconsin and available to Wisconsin schools, was a fundamental factor. Yet the groundwork had to be laid carefully. It happened that Dr. Schuller had become acquainted with the Superintendent of Public Instruction, Dr. William Thurston. After a series of conferences with him and his staff, the Superintendent addressed a letter to President Hannah of Michigan State University indicating his support of the state's need for additional film library services at MSU.

An additional argument lay in the fact that although there were several minor collections of instructional films on the campus, there were none for the College of Education, which was preparing a majority of the new teachers for Michigan schools. A further consideration was the fact that most of the university's departments had limited access to films for their own instructional programs. In individual conferences with each of the some 85 department heads, the Director ascertained that practically all would favor a library on campus containing films recommended by their own faculty members. Thus, over time a sufficiently strong case was built for establishing a new film library at MSU to serve the needs both of the university's instructional programs and those of the schools and other educational agencies of the State of Michigan. Sufficient funds were provided for initial film purchases and staff, and the MSU film library began operating during the 1954-1955 academic year.

Joint Film Catalog With the University of Michigan

After several years of independent operation, arrangements were made with the University of Michigan to produce a joint catalog and improved services to the clients of both film libraries. Details are unimportant here beyond pointing out that this was one of the first examples of inter-institutional cooperation among the State's institutions of higher learning. It came at a time when the Michigan legislature and various taxpayer associations were highly critical of duplication of programs and functions among the state's colleges and universities. (It is interesting to note that for several years after its inception, a current edition of the UM/MSU catalog of instructional films was prominently displayed in President Hannah's reception room.)

Instructional Program

Within a year or two of the establishment of the Audiovisual Center in 1952, the Director began teaching classes for in-service teachers in Audiovisual Materials in Teaching. The College of Education was glad to have course offerings in Audiovisual Instruction, so no difficulty was experienced in getting initial approval. A few courses were taught on campus and in-service courses offered through Continuing Education were given around the state. Initially the Director did all of the teaching, but as new staff members came on board both course offerings and the number of classes gradually expanded. At the beginning, offerings were incorporated within the Department of Secondary Education and Curriculum and a few students began to obtain Master's Degrees with a special field in Audiovisual Instruction. In addition, students from other colleges and departments of the university began enrolling for classes and two or three doctoral candidates had completed their work with a special field in Audiovisual Instruction before a major surge in advanced graduate enrollment took place in the early 1960s with the advent of the NDEA Fellowships.

In the interim, each new faculty/staff member employed in the Center was selected on the basis of two criteria. The first was strong teaching experience and qualification to teach media courses in the College of Education. The second was expertise in a particular specialty, such as graphics, film production or administration of media programs. During the early years, all IMC professionals received faculty rank in the College of Education and were given a variety of administrative and instructional responsibilities. This was in accord with the initial philosophy--that the underlying function of the Center was improving instruction on the university campus. The extension of this principle to improving instruction in the public schools as well was readily accepted, though no official action was ever taken. Somehow the instructional program, like the Center itself, grew a bit like "Topsy," although not without a calculated plan. Its steady development was suddenly jarred, however, with the advent of the NDEA Fellowship program.

In 1960 a friend in the MST Contracts Office inquired why we had not applied for Fellowship monies as a number of other departments on campus were already doing. Thus prompted into action, the Director immediately made the necessary application and within a fairly short time grants were received for four doctoral fellowships. At this point, the College of Education Curriculum Committee was suddenly galvanized into action. It was discovered that we had a doctoral program being funded for fellowships by the federal government, when, in fact, no such program officially existed. This created quite a stir and some consternation. All was resolved, however, with the help of the excellent relationships which had been built up within the College of Education and around the university, so that in almost record time a Doctoral program was approved both by the College of Education and the University Curriculum Committee. Announcements of the Fellowships were sent out nationwide in the Spring of 1960, and by that Fall four doctoral candidates were officially enrolled in the program. This Fellowship Program continued for several years.

The Doctoral Fellowship Program in Instructional Technology provided a big boost to our advanced graduate program at Michigan State University. The wide publicity attendant with the nationwide announcement resulted in a few of the more qualified and experienced applicants "shopping around" at several of the institutions having such programs (notably USC and Syracuse) before making a decision on which bid to accept. This was basically healthy, in that it provided a kind of focus upon program quality that benefited all participants and also indirectly generated added administrative support at MSU for the establishment of needed new positions. Further, the Fellowship students provided an essential corps of top-notch students and a morale that helped to attract others coming primarily on their own resources. At the same time several other developments were occurring which helped to enhance the overall program at MSU.

Brazil Project

Through a series of fortuitous events, a contract was arranged between the Agency for International Development (AID), the Brazilian Ministry of Education, and Michigan State University. This program had as its underlying purpose "bringing the benefits of audiovisual education to the school systems of Brazil." Without going into the details of the project beyond saying that it was highly successful in spite of being cut off after four years by a change of presidential administration in Washington, there were a number of highly positive results for the overall MSU program:

1. Key staff members received the broadening experience of working overseas in a developing country. Dr. Horace Hartsell, Associate Director of the Center at MSU, served as Chief of Party from 1960-62; Dr. James Page from 1962-64; Professor Edward McCoy, Head of Film Production, served as Chief of Film Production for the Brazil Project, and Dr. Charles F. Schuller, the Project Director, made five trips to Brazil for periods of several weeks to two months during the four years.

Several other MSU personnel, including Dr. Armand Hunter, Head of Television and Broadcasting Services, Professor Wildred Veenendaal, Head of Graphics Division, and others went to Brazil as consultants with project responsibilities in their special areas.

2. The Brazil Project contributed to the visibility of the Instructional Media Center and its programs, both on and off campus. The Brazil contract was the first major contract in a series of federal and other grants over the next 14 years which totaled in excess of $8,500,000. The prestige created by such grants within the university administration, plus the monies made available for graduate assistantships and other residual benefits because of savings in salaries resulting from the grants, unquestionably were major influences in the growth of the IMC and graduate program. The resulting administrative recognition and support on campus for IMC programs was reflected in such practical terms as new positions and budgetary increases. It contributed, as well, to national awareness of MSU's academic program and helped stimulate applications for advanced graduate study over an extended period of time.

3. A part of the Brazil Project called for bringing selected media professionals to the United States for graduate work. The bulk of these came to Michigan State University, thus further enhancing the enrollment in our graduate programs in media--as well as our reputation in international programs, numerous students from other countries came to MSU for advanced work in Instructional Media and Technology.

In addition, over time, many of our IMC staff members became involved in project or teaching assignments in other areas, such as Nigeria, Pakistan, Far Eastern countries, Western Europe and Iran.

The Educational Development Program (EDP)

As in most successful developments in mankind's institutions, be they in business and industry or in social institutions such as higher education, a variety of factors are normally involved. Some of these can be ascribed to leadership and good planning; others, including the coming together of a number of powerful factors at just the right point in time, can only be ascribed to fortuitous circumstances. So it was with the Educational Development Program at MSU and its impact upon IMC organization and graduate training programs.

The reader may recall that when establishing the Media Center in 1952, the new director secured agreement that the underlying function of the Center was to improve instruction. This seemingly obvious "given" was by no means universally held in those early days, when audiovisual service units tended to be regarded somewhat on a par with such agencies as electric shops, sign shops and bookstores. The difference, of course, lay in the fact that, aside from the purely technical positions in graphics, sound, film, and photography, the individuals heading these units, in addition to their specialities, had to be essentailly **teacher-educators.** On that basis it became possible to pull together the outstanding professional staff to which much of the credit for the later developing eminence of MSU's academic program properly belongs. Some staff have already been noted in the description of the Brazil Project. Other notables include: Dr. Paul W. F. Witt, who came to MSU in 1967 after 24 years in a similar position at Teachers College, Columbia University, and who assumed a primary role in our academic programs and as our chief liaison with the College of Education; and Professor Floyde E. Brooker, former Head of the Audiovisual Branch in the International Cooperation Administration (ICA)--as well as former Executive Secretary to the Department of Audiovisual Instruction (DAVI) of the NEA. Among others who have distinguished themselves on the MSU/IMC staff for varying periods were: Dr. John Barson, formerly of Wayne State University, who headed two pioneer benchmark studies on Instructional Development; Dr. James Nord, formerly with the Oregon State System of Higher Education, Division of Teaching Research; and Dr. Castelle Gentry, formerly of the University of Toledo, Syracuse University and the University of Maine.

Origins of Instructional Development at MSU

It was at the first Okoboji National Audiovisual Leadership Conference, in 1955, that the senior author first heard the concept of Instructional Systems discussed. It was at an informal after-dinner get-together of several people, including Dr. Charles Hoban of the University of Pennsylvania, Floyde Brooker, then Executive Secretary of DAVI, and others. Charlie Hoban suggested the possibility of applying systems principles derived from engineering to the instructional process as a broader base for more appropriate employment of audiovisual materials in instruction. The idea caught on and the following year, at the second Okoboji Conference, Dr. Hoban gave the keynote address, which he entitled "A Systems Approach to Audiovisual Communications."

Several years later the writer sought and received a grant from the U. S. Office of Education for a Demonstration and Evaluation Project in Instructional Systems Development. Dr. John Barson was brought in in 1962 to head up this project, which involved, besides MSU, Syracuse University, the University of Colorado, and San Francisco State College.

Even though relatively little was known at that time about applying a systems approach to instruction, all four institutions were keenly interested, and undertook, each in its own way, to apply and test the efficiency of the concept. The project ran from 1963 to 1965 and the final report was published in 1967. To the writer's knowledge this was the first formal project on instructional development (ID) in any American university. While the findings were not dramatic, a good deal of experience was gained from the efforts of these four institutions, much of which was applied in some of their own graduate programs and provided the basis for future efforts in instructional development. It was at this point that graduate training at MSU began to include ID as well as media.

Establishment of EDP at Michigan State University

Like most other major universities during the early '60s, MSU was suffering from burgeoning enrollments, a shortage of faculty, limited resources, and the effects of the "explosion of knowledge" which was changing the dimensions of many content-areas of the university curriculum. Under the leadership of Dr. John Hannah, President of MSU, with a grant of $440,000 from the Ford Foundation, an experimental program was launched in 1964 in educational development for undergraduate education. Fortunately, an outstanding scholar/administrator by the name of Dr. John Dietrich was named to organize and head up the EDP program.

One of the important developments of the EDP program was a reorganization of media facilities on the campus, resulting in the concentration of all of those relating to instruction falling under the direction of the Provost--the highest academic office in the university. An important aspect of this reorganization was that closed-circuit television, then being used exclusively for instructional purposes, was shifted administratively from Broadcast Television into the Instructional Media Center program. At that point, Dr. Erling Jorgensen, formerly with the Midwest Program in Airborne Television Instruction (MPATI), was brought in as part of the IMC staff. Under his direction, some 150 classrooms on campus were equipped for receiving closed-circuit television, and many of these rooms were used for multiple sections of large courses offered for all freshmen and sophomores through the University College.

There had been much concern before this program was launched that students might object to receiving instruction through CCTV and numerous steps were taken to minimize such possible negative effect. One of these steps was the careful development of the courses themselves so that they were more than the "talking faces" of lecturers. Another was to supply graduate student monitors in each of the sections for purposes of answering questions and providing needed clarification. A third step, with the help of the Evaluation Service, careful studies were made of both student achievement and student attitudes toward use of the medium for substantial segments of their instruction in those courses. These studies revealed: (1) that student achievement was at least as good as under the old large lecture-hall system formerly in effect, and (2) that while students preferred a live lecture to a televised one, that preference was more than offset by: (a) the convenience of having their instruction in dormitory classrooms rather than somewhere across campus, (b) the possibility of having repeat telecasts of the same lesson in case some were missed, and (c) regular meetings with assistance to clear up questions, take tests, and generally to keep closer track of individual progress than was normally the case in large lecture sessions.

The Educational Development Program encompassed much more, of course, than simply changing formats and making instruction more rapidly accessible to students. An important part of the original project was the provision of funds to support faculty experimentation on approved projects and to free instructors time to engage in these studies. Further expert assistance was provided within the framework of the systems approach to improve the quality of instruction in various colleges and departments across campus.

An important part of the EDP organization was the Learning Service, headed initially by Dr. Robert Davis, a specialist in learning psychology and instructional design. Some years later, when Dr. Dietrich took over other responsibilities in the Office of the Provost, Dr. Davis became Assistant Provost for Learning Resources. He assumed responsibility for the IMC and EDP, and established a much closer relationship with the University Evaluation Services. Dr. Larry Alexander was then appointed to head up the Learning Service.

Readers interested in a more thorough analysis of instructional development of the EDP at Michigan State are referred to the publication "Commitment to Excellence--A Case Study of Educational Innovation," by Robert H. Davis, Allan J. Abedor, and Paul W. F. Witt, Michigan State University, East Lansing, 1976.

UNIVERSITY CONSORTIUM FOR INSTRUCTIONAL DEVELOPMENT AND TECHNOLOGY (UCIDT)[1]

In 1964 Dr. James Finn (USC), Dr. Donald Ely of Syracuse, and Dr. Schuller created a university consortium--in conjunction with the Special Media Institutes program which had been established under the old NDEA Title III to provide special training institutes in media for classroom teachers in various subject areas.

The National Office for the Special Media Institutes (SMI) Project as well as for the Consortium was located at USC under Dr. Finn's direction. Following his untimely death in 1969, the Office of Education required that the headquarters for the project be relocated. At the urging of his colleagues in the Consortium, Dr. Schuller accepted the Directorship and the National Office was moved to Michigan State University.

At about this time, the National Special Media Institutes had essentially run their course. An independent evaluation survey contracted by USOE concluded that the program had been effective with the some 600 teachers who had participated across the country, although its overall impact in bringing innovation and change to education was limited. Something broader was needed. The vehicle ultimately chosen by USOE was instructional development.

During the middle to late '60s the EDP program at MSU was rather remarkably successful. It was reasoned in USOE that if such a program could be successfully developed in a university with all of its inherent constraints and conservatism, an appropriate program for the public schools held promise of being equally if not more successful. So a new federal contract was arranged with the Consortium for training teams of teachers, administrators, curriculum and other specialists, and school board members in the principles and operation of instructional development programs for the public schools. After tryout and revisions in four major cities, and the selection and training of teams in some 20 states to put on the Instructional Development Institutes (IDIs), some 350 to 400 IDIs were conducted in school systems across the United States during the period from 1971-1974. The impact was indeed substantial.

For our purposes here, however, the point is twofold. First, the intensity and thoroughness with which the IDI model and the training materials for its implementation were designed, developed, evaluated and revised has probably never been equaled. In consequence, large numbers of staff members and graduate students at the four Consortium institutions became relatively expert in a short period of time on the practices as well as the principles of effective instructional development. Second, the benefits of this rare and remarkable phenomenon are readily apparent today in the work being carried on across the country by literally hundreds of recipients of advanced degrees from the Consortium institutions. Recent surveys also indicate that these materials continue to be used in a large number of graduate programs outside the Consortium.

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[1] The original members of the Consortium were Michigan State University, Syracuse University and the University of Southern California. The Teaching Research Division of the Oregon State System of Higher Education joined a few months later. Indiana University became a member in 1971 and Florida State University in 1978. Inquiries about the Consortium and the Instructional Development Institute (now in its third major revision) should be addressed to:

Dr. Donald Ely, National Director
Area of Instructional Technology
130 Huntington Hall
Syracuse University
Syracuse, NY 13210

Curriculum Development in Instructional Technology

The impact of the IDI's upon graduate programs in this field has, of course, been profound and pervasive. Early in the game, Consortium staff members began using segments of the IDI in their courses. The same was doubtless true of training teams from other institutions. For a number of years the Consortium institutions put on IDI's for their own faculty and graduate students. Later, individual modules, or parts of modules, came into use in advanced graduate seminars or other courses as appropriate.

There seems little question that the advent of systems in instructional design helped to spell out the demise of the long-respected term "Audiovisual." It is interesting to note, for example, that the North Central Association of Colleges and Schools was using the following definition of instructional technology in the early 1970s:

> "Instructional Technology is the combination of human and nonhuman resources employed in a systematic way in the design, implementation, and evaluation of the total process of learning and teaching....It links the human resources of instruction/information networks which include materials and machines for print, audiovisual media, television and radio, amplified telephone, learning laboratories, the computer, games and simulation, and teaching machines."

The first course offered at Michigan State in the early '50s was entitled "Audiovisual Materials in Teaching and Learning." This course was designed primarily for in-service teachers and focussed upon the selection and effective use of various types of AV materials in school situations. (Similar courses are still being taught for graduate students.) Several years later, a course called "Audiovisual Instruction," on a more elementary level, was provided for undergraduate juniors and seniors preparing to become teachers. During the later '50's a course in AV Administration was also offered for people working on a Master's degree or desiring to prepare for a position in the AV field. The balance of course work for the Master's candidates (and the majority of course work for Doctoral candidates) was focussed upon curriculum, educational psychology, administration and other areas of particular interest or need for the individual student.

With the addition, in the early '60s, of the instructional development emphasis at Michigan State and the advent of an official Doctoral Program in Instructional Technology, we began offering courses and seminars on instructional development in higher education. Also, at this point, with the help of Dr. David Berlo, Chairman of the Department of Communications, a series of courses in communication, the adoption of innovation and change, and a particularly good sequence of courses in statitstics and research design were incorporated into the doctoral program. By the early '70s, in keeping with events described earlier, there was an increased focus upon instructional development in practically all courses. A staff curriculum committee for professional programs was established which carefully examined the entire program of course and seminar offerings for both professional preparation courses for majors and service courses for teachers. Out of this continuing sifting and winnowing of the knowledge resulting from rapid changes occurring in the field, a series of broadened course-offerings was designed which incorporated all components of the ID process but which retained media as a necessary part of most delivery systems. During this period, the official title of the graduate program was appropriately changed to Instructional Development and Technology (ID&T).

PART II
THE PRESENT - WHAT WE ARE

Now that we have examined the origins of the academic program at MSU we will examine its current status. As indicated earlier, the program was initiated by Dr. Schuller, who was head of the IMC. However, its academic home was and continues to be in the College of Education. The program was nurtured and grew due to the interest and efforts of the IMC staff, but over time the College began to provide funds for faculty support. The IMC's major influence on the program was due simply to the fact that the impetus for continued growth and support would need to be shifted more and more to the College of Education.

The transition was gradual and evolutionary, based upon a recognition by all concerned that its strength should be maintained throughout the process. Everyone wished to insure the strength of the program and protect its national and international stature. Due to his heavy commitments in other areas, Dr. Schuller had named Dr. Witt as head of the academic program, and he and Professor Veenendall played key roles in facilitating a smooth transition. Both assumed active roles in the College of Education governance, including sitting on its highest-ranking committee (Academic Council) and serving as coordinators of the program in Instructional Development and Technology. Upon the retirement of Dr. Witt, followed a year later by the return of Professor Veenendall, Dr. Gentry assumed the coordinator's role for the Program.

Today, faculty from the program sit upon virtually all of the college's committees and several university committees. One now chairs the Executive Committee of the Academic Council and another is a member of the Executive Committee and Council. The College Curriculum Committee includes at the university level a faculty member from the program and the six-member University Committee on Instructional Computing includes an Instructional Development and Technology faculty member. The complete list of committee assignments is quite lengthy, but the reader should now have gathered that committee activity is now much more time-consuming for Instructional Development and Technology faculty members than in the past. Another way of saying it, is that we have been "institutionalized." The issue is not simply economics, however, since College policies and procedures now more heavily influence program operation and future direction than had formerly been the situation.

Thus we arrive at the present status of the academic program. Faculty members for the program are now drawn from a variety of units within the university. As of 1980 there are no faculty members who have a full-time teaching responsibility, although three are completely supported by College of Education funds. While only one faculty member is shared with the IMC, there has been an increase in the number of faculty members shared with the research and development units in the university's two colleges of medicine. Also, the College of Education has increased its percentage of support for a number of ID&T faculty members. Thus, the total number of faculty members has not changed significantly, but its composition is considerably different than in the beginning. Further, there is a wider range of support and field experiences now available to students.

The basic media courses in the ID&T curriculum continue to be offered and attract both majors and non-majors. However, no courses in production and management have been added in recent years. New additions to the curriculum reflect the other interests and activities of the faculty. For example, recent additions include a course in functioning as an instructional development consultant, another in diffusion of educational innovations and a third in developing instructional products for business and industry.

As indicated earlier, the nature of faculty activity expanded over time from an initial focus upon "audiovisual" to that of instructional development. Naturally the academic program expanded its content to parallel these changes. As the Educational Development Program came into being along with extensive instructional development activities, the academic program evolved along comparable lines. It is fair to say that the training of graduate students has to a large degree been a mirror of the growth of instructional improvement activities on the MSU campus. This continues to be the case as faculty development and organizational development have become an added thrust towards educational improvement at MSU. These new thrusts have not replaced the concern for providing students with skills in media and instructional development, but rather are additional elements which reflect current developments in the field. Hence, the number of course offerings has continued to grow, and now consumes a large portion of each student's total program than in the past.

The Learning and Evaluation Services (L&ES), which is the campus-wide ID agency, has expanded its activities to include both faculty development and organizational development. In earlier years, L&ES devoted much of its effort to instructional development projects, most of which had major media design/development components. Currently, however, L&ES devotes much of its resources to faculty development by conducting workshops for faculty members upon a variety of topics such as student evaluation, faculty evaluation, objectives writing and media production. Consequently, the half-dozen ID&T students holding assistantships in L&ES have considerable exposure to and experience in conducting faculty workshops, but less than formerly in instructional development. The L&ES also has an organizational development (OD) specialist, who spends much of his time conducting workshops on OD topics and working directly with faculty members and administrators. Typical concerns of the OD effort are: improving comunication among administrators, faculty members and students; raising faculty morale; and establishing a climate for innovation. Thus, the L&ES staff who teach our courses have refocussed some of their research and writing interests, which in turn has affected the content of their courses.

The three ID&T faculty members who are shared with the university's two medical schools also do little of what traditionally would be called instructional development. One is heavily involved in a major long-term faculty development project which includes recruiting, orienting and training practicing physicians to assume faculty positions. Another is conducting research on, and developing certification examination procedures for, a medical specialty. The third administers a curriculum development center. This is not to suggest that no faculty members have instructional development responsibilities. A number of faculty members continue to provide these services, including one in the IMC, two with campus-wide television services and one who directs a learning resources center for the College of Education.

The ID&T faculty have always shown a great deal of interest in international projects and in students from other countries. It is interesting to note that the largest international projects occurred a number of years ago and resulted in many opportunities for faculty members to work in other cultures. However, these projects did not result in a major influx of foreign students. More recently, the size and scope of international projects conducted by the ID&T faculty is smaller, but the number of requests for admission to the program from other countries have increased. At the present time about 20 percent of the ID&T student body is from other countries, though only a few are from any one place. The ID&T faculty have always been concerned that we not have a high concentration of students from any one country, and so have not solicited projects which would require such an arrangement. The increased number of foreign students has considerably broadened the perspective of both faculty members and students, and in general the results have been positive. However, the wider range of cultural and educational backgrounds increases the burden of the faculty when attempting to select relevant instructional examples and to provide appropriate field experiences. We have heard from some colleagues at other institutions that their students often either don't go home or don't stay there, but informal feedback from our graduates suggests the opposite. We plan to conduct a follow-up study of all graduates within the next year and will then be in a better position to judge the impact of our program upon instructional technology in other countries.

As noted earlier, cooperative efforts with other instructional technology academic programs, especially through the University Consortium for Instructional Development and Technology (UCIDT), have always been a hallmark of the MSU program. Today, some 16 years after its inception, the Consortium continues to affect and be affected by MSU. It has expanded its membership to include other major graduate programs, and regularly offers in-service workshops for professionals in the field. It is interesting to note that the Consortium also evolved from an intital focus upon special media institutes to its current focus upon instructional development. This transition parallels the changes which have occurred in the academic program at MSU. It is fair to say that while MSU has had a profound effect upon the Consortium, so has the Consortium had a profound effect upon MSU. It continues to be an important source of professional growth and renewal for MSU and we expect the relationship to continue.

Job placement has always been a major strength of ID&T at MSU. Defying the trend in education toward fewer jobs available and more students seeking them, we continue to place all our graduates in "appropriate" types of professional positions. The term "appropriate" is deliberately placed in quotes to highlight a significant change which has occurred in placement (and later job mobility) of our graduates in the last few years.

During the early years, almost all Doctoral graduates of the program sought and attained positions in higher education, while most Master's students entered public education. Many of those entering higher education became faculty members and assumed primarily teaching roles. In fact, a number of well-known instructors in instructional technology departments around the country are MSU alumni. Another major role for earlier graduates was to teach and engage in instructional development in higher educational institutions. Those in public education usually became administrators of media programs.

But a few years ago we noticed a change in placement patterns. Some new graduates, and some not-so-new alumni, began to take positions in a variety of other settings. At first, the pattern was unclear, and was limited to a few people. Later it became more evident that a definite trend was occurring, with an ever-increasing number of people taking positions in business, industry, commerical enterprises and governmental or quasi-governmental agencies. At first we attributed this emerging placement pattern to a decreased demand in education. However, we have since determined that, although reduced demand in education was a contributing factor, of more importance was an increased demand in other settings. This trend has been confirmed by colleagues in other institutions, and is even more apparent in some of the graduate programs in urban universities which are closer to the industrial market. In fact, the demand in business and industry for graduates seems to be increasing at a much faster rate than we can expect to supply. The challenging positions, financial rewards and career-growth opportunities in these new areas are extensive and promise to have a profound effect upon our graduates, our academic program and our entire profession in the future.

On this note, it is appropriate to conclude our consideration of the present status of the program and look to what the future may hold. Our philosophy remains the same - to promote the widespread intelligent application of instructional development and technology to the educational problems and opportunities of our world. But our definition of educational problems and opportunities has expanded as the world around us has changed. Education is no longer the exclusive nor even the primary domain of schools. As more and more education moves out of the school, instructional technology must necessarily follow. The last part of this chapter is devoted to speculating upon what the future holds in terms of needed curriculum change and new instructional delivery systems.

PART III
THE FUTURE — WHERE ARE WE GOING?

To look into the future is perhaps the most difficult activity of all. History teaches us that our ability to predict is often quite accurate in the short run, but quite inaccurate for the longer term. By simply projecting current trends we can predict selected short-term conditions with confidence.

However, rapidly emerging physical, electronic and behavioral technology makes us much less certain of other predictions.

We must also keep in mind that we as a profession are **part** of a larger society; we do not stand **apart** from it. We both influence and are influenced, we change and are changed, we contribute and we receive. From this rather humble perspective we offer the following estimates of what the future may hold, not just for professional education at MSU, but for the profession-at-large.

Our discussion is divided into two sections: (1) where will the new knowledge in our profession come from, and (2) how will we (at MSU) probably deliver it?

New Knowledge Sources

As we enter the decade of the '80s, the traditional knowledge sources appear to be altering in importance. From an intellectual standpoint, the majority of our information in the past came from the physical sciences (electronic and photographic devices), psychology (learning theory), communications (communication theory) and engineering (general systems theory). Although these areas will continue to supply useful information, it seems likely that management, business administration, biology, and political science may become major sources of useful new concepts and principles. An example is the research on hemispheric dominance, which may have major implications for how we organize and deliver instruction.

Current and future high technology is also breeding more complex formal and informal organizations. In order to have impact, we must become even more adept at understanding and being able to modify increasingly-complex organizations and successfully interacting with the people within them. Otherwise we will become the technicians while someone else determines the direction. Social psychology and political science should be of value as we attempt to deal with these issues. Likewise, management and business administration will become more central concerns as we are pushed to become more efficient and productive in both creating and operating education and training systems of proven effectiveness.

The point should not be lost that these "added" disciplines often rely upon what we may consider unconventional methods and means for creating and applying their knowledge. Thus we will need to broaden both our perspectives and our skills if we are to gain from and contribute knowledge in these areas. This is not to suggest that the more traditional sources of new information will lose their importance. Rather, it means we must be alert to developments in an ever wider range of disciplines than in the past.

How We Will Deliver Knowledge

It is safe to predict that over time our delivery systems will also change. Not because universities like to change, but because we will be forced to change. Forging new alliances with colleagues in other disciplines will be of high priority. Our students will need to be self-schooled in management and in the nature of organizations, and to accomplish this we must rely upon others. Unfortunately, we will not be able just to simply send our students to them for "treatment." Rather, we will need to be actively involved in developing a curriculum based upon knowledge in those areas which are relevant to our students. This activity is analogous to what was done in the past with psychology and communications (i.e., helping them define what is of interest to us).

Our clientele will change. As the cost of education rises and employment opportunities in our field abound, we will probably see fewer full-time students. Distance learning, part-time arrangements and cycles of education and work will become more common. Numerous current requirements,such as residency and class-contact hours, will need to be reexamined. Both faculty members and students will need to become adept at operating in a variety of instructional settings.

More specialization of programs will probably occur with perhaps less emphasis upon degrees. We expect more students to come back for short-term "re-treading" on a periodic basis, not for a degree, but to acquire needed new competencies. International students will continue to find the program attractive and may become the primary source of full-time students. (The implications of having primarily foreign students available for on-campus assistantships are many, but are beyond the scope of this chapter.)

All of the above forces will place new burdens upon the faculty to acquire additional skills and to engage in continuous redevelopment of the curriculum, while re-defining our relationships with students. Unfortunately, we will probably not be in a position to hire new faculty members as the university comes under increasing pressure to curtail expenditures and adapt to tight times for at least a few years. Lack of new faculty members and reduced budgets for development signal a decade of extreme challenge to the profession.

The most critical issue for the future has been reserved for last. We in the profession must come to grips with what may be one of the greatest issues of our time--productivity. Our society has been built upon employing its technology to gain efficiency and productivity. The country has grown and prospered and we enjoy one of the highest standards of living in the world because we have used a vast array of physical, electronic and human technologies to steadily increase our over-all efficiency. However, as of 1980, we seemed to have reached a plateau. For six successive quarters our national economy has experienced a decline in real productivity. This appears not to be simply a statistical aberration, but rather signals some fundamental flaws in our economy. While it would be gratuitous to assume that instructional technology can identify and remedy all of these flaws, it is nonetheless reasonable to expect that it can make a contribution. In industry, one obvious area is assisting in the development of more efficient and effective training programs which shorten training time while increasing worker competence. In the education sector, we must face the issue of whether we can (and are willing to publicly state) that instruction can be made more efficient. Most of our efforts to date have been directed at effectiveness, but the time seems ripe to make a bold step and strike out in pursuit of increasing productivity by accomplishing more with less. We, as a still somewhat primitive technology, have not really addressed ourselves to these concerns. It is time for us to make an active thrust and attempt to demonstrate that instructional technology can increase productivity in a wide variety of settings. Concentrating upon effectiveness has brought us a long way, but if we hope to scale the next height, productivity provides the ladder.

Conclusion

The professional preparation program at MSU, which began as a single AV course, has developed and evolved into a large and comprehensive program in instructional technology. Each step was taken through the dedicated efforts of both faculty members and students. We are what we are because of our close association with the university's instructional improvement agencies. We remain committed to improving instruction, but now include settings far from the campus. Our commitment is to train service professionals who will assist others to do better what really needs to be done. Our focus is pragmatic and our style eclectic. We are action-oriented, as were our audiovisual forefathers. But we recognize that the world is changing and hence we are also changing. We are optimistic about the future, but recognize that our resources are limited, while the demands upon our energies are increasing. Nonetheless, we are committed to building and growing on the basis of our proud heritage.

Chapter 45

The Potential for Professional Certification in the Field of Instructional/Training Design

Barry Bratton

Increasing numbers of people in many walks of life are calling themselves instructional developers or training officers. But are they in fact skilled in those abilities usually ascribed to the instructional developer or training officer? Can we truly be deemed a profession if standards are not prescribed and upheld for those practicing in the "profession"?

This chapter deals with the attempts of AECT and other organizations to deal with this problem through an exploration of certification.

Professional certification!
Who needs it?
We do!
No, we don't!
It'll advance the field!
It'll stymie the field's growth!
It'll cost all of us money!
It'll help secure jobs!

Few ideas have held the attention of professional instructional/training designers over the past few years more than the possibility of professional certification. The Division of Instructional Development within the Association for Educational Communications and Technology has been particularly active in investigating certification, and now other organizations, such as the American Society for Training and Development and the National Society for Performance and Instruction, also have begun to show interest. Whether professional certification will become a reality remains to be seen, but there is no doubt that it has emerged as an important topic in the instructional/training design field.

In this chapter I will trace the historical developments which lead to the current interest; distinguish among certification, accreditation and licensure; present the recently-developed list of instructional/training design competencies; and describe the current thinking about assessment (certification) procedures.

CERTIFICATION IN AECT

Of the three organizations named above, the Association for Educational Communications and Technology (AECT) has the longest history of showing interest in professional certification. Finn (1953), writing in the Association publication Educational Communications and Technology Journal (then called Audio-visual Communication Review) was the first to note that certification was a major ingredient necessary for professionalizing a field. When the AECT became an independent organization in 1970, a standing committee on certification was created to assist the Association's state affiliates to identify proper job titles and descriptions for teacher education certification. In 1977, the AECT published Educational Technology: Definition and Glossary of Terms which noted that the field still lacked a certification program. In that same year, the AECT Board of Directors created a special task force to study professional certification and develop a set of recommendations. After two years of work, the task force presented a Final Report to the Board which recommended that (1) the Association undertake the development of a professional certification program and (2) the three largest AECT divisions (Instructional Development, Media Management, and Media Design and Production) be responsible for delineating the competencies in each area and specifying the assessment procedures. The Board of Directors adopted the Report in 1979.

The Report calls for the creation of a Certification Institute Board to oversee the certification program once it is developed. The Board would consist of persons representing practitioners, employers, academic programs and the three AECT divisions. All Board members, except the employers, must be members of the AECT; all would serve without pay. The Board would develop and manage the program and be responsible for updating the competencies and assessment procedures as necessary. There has been no movement by the AECT Board of Directors to establish such a Board to date (February 1983).

CERTIFICATION, ACCREDITATION, LICENSURE

Certification, accreditation and licensure are all credentials respected by society, for we assume that those persons who possess them have demonstrated their competence in specified areas and are qualified to perform in those areas. The credentials are similar in that they are one means of distinguishing between the qualified and the unqualified in a particular field. However, while the goal of all three is to measure competence, certification should not be confused with the other two credentials.

Accreditation is the process whereby an agency or association grants public recognition to a school, college, university, or specialized study program that meets certain predetermined qualifications or standards. It is an example of voluntary self-regulation of professional preparation by peer professionals. Usually a self-study by the institution or program is validated by a visiting team of professional colleagues; The National Council for the Accreditation of Teacher Education is an example of an accrediting agency. Only institutions or programs, not individuals, can be accredited.

Licensure, on the other hand, is a mandatory legal requirement for certain professions in order to protect the public from incompetent practitioners. Licensing procedures are generally established or implemented by a political governing body that proscribes practice without a license. Certain health providers, such as physicians and dentists, must be licensed to practice. Licensure concerns only the individual, not the educational program or institution.

Certification is the process by which a professional organization or an independent external agency recognizes the competence of individual practitioners. It, too, is an example of voluntary regulation by peer colleagues. Standards by which individuals become certified vary considerably among professions, but the more common ones include membership in the professional association, successful completion of an accredited program of study, and satisfactory performance on written or performance examinations. Achieving certification means public recognition of the individual for possessing specified skills at a prescribed level of performance.

Professional certification should not be confused with teacher certification. The latter is a misnomer, because, in reality, it is a licensing mechanism regulated by a legal body. State governments, for instance, require that teachers hold a valid certificate (license) in order to teach in the public school system. Endorsements added to the certificate permit the holder to teach specialized subjects or to work in a specific area, for example, as a library/media specialist. In most states the only requirement for receiving a teaching certificate, and subsequent endorsements, is the satisfactory completion of a recognized program of study. Teacher education certification is intended to establish and maintain standards for preparation and employment of public school personnel, not to screen candidates for admission to a profession.

The subject of this chapter is professional certification, that is, the recognition by a peer group of its members' ability to practice in the profession. Professional certification rests on the assumptions that (1) those served by members of the profession cannot adequately judge the merits of professional services at the time those services are being rendered, and (2) only members of the same profession are qualified to judge whether one of its members possesses the knowledge and skill to practice in a competent way. The primary responsibility for establishing and maintaining certification standards therefore rests with the profession itself.

CERTIFICATION AND THE DIVISION OF INSTRUCTIONAL DEVELOPMENT

Given the preceding background, it therefore appears appropriate that the Division of Instructional Development (DID) within the AECT should be responsible for identifying the competencies for instructional/training designers and the means by which these competencies can be assured. This section will briefly describe the early history of the Division's activities in the certification movement and conclude with a presentation of the competencies list which resulted from these activities.

The DID Board of Directors first appointed a task force in early 1978 to participate with the larger AECT Certification Task Force. The Board charged the Task Force to begin identifying competencies in instructional design and to serve as a liaison between the Division Board and the AECT

Certification Task Force. The DID Task Force was very active: the first list of competencies was drafted by February 1979. Subsequent revisions appeared in February 1980 and again in September 1980. The latter version was mailed nationally in 1981 to all DID members for their evaluation and comments. Over 200 DID members responded with suggestions and comments; and more than half favored the idea of professional certification. In May of the same year, the competency list was presented at the National Society for Performance and Instruction Conference where participants examined the competencies and offered suggestions for improvement. Later the Task Force took all of the feedback information and developed the present list of ID competencies.

The DID Board of Directors tentatively approved the competencies in early 1982 and recommended that the Task Force turn its attention to assessment procedures.

Throughout their years of work, the Task Force members adhered to the following precepts with regard to the competencies:

1. The competencies would reflect the skill of a professional instructional/training designer, regardless of her/his current job, position, academic degree or type of training.
2. The competencies would be performance-oriented rather than academic-oriented.
3. While some employment situations may

Figure 45-1. Instructional/training development competencies.

A competent instructional/training development specialist is able to:

1. Determine Projects Appropriate for Instructional Development
   *Analyze information regarding potential projects and decide if instructional development is appropriate.
   *Discriminate situations requiring instructional solutions from those requiring other solutions (e.g., job redesign, organizational development, etc.).
   *Judge the appropriateness of project selection decisions and provide a rationale for the judgment.
2. Conduct Needs Assessments
   *Develop a needs assessment plan including selection of procedures and instruments.
   *Conduct a needs assessment and interpret results to suggest appropriate actions.
   *Judge the appropriateness, completeness, and accuracy of given needs assessment plans and results.
3. Assess Learner/Trainee Characteristics
   *Distinguish among entry skills assessment, prerequisite assessment, and aptitude assessment.
   *Identify a range of relevant learner/trainee characteristics and determine methods for assessing them.
   *Develop and implement a plan for assessing learner/trainee characteristics.
   *Judge the appropriateness, comprehensiveness, and adequacy of a given assessment of learner/trainee characteristics.
4. Analyze the Structural Characteristics of Jobs, Tasks, and Content
   *Select and use a procedure for analyzing the structural characteristics of a job, task, or content which is appropriate to that job, task, or content and state a rationale for the selection.
5. Write Statements of Learner Outcomes
   *Distinguish objectives stated in performance/behavioral terms from instructional goals, organizational goals, learner activities, teacher activities, and objectives written in other styles.
   *State an outcome in performance terms which reflects the intent of instruction.
   *Judge the accuracy, comprehensiveness, and appropriateness of statements of learner outcomes in terms of the job, task, or content analysis, and/or judgment/opinions of the client (e.g., subject- matter expert, faculty, etc.)
6. Analyze the Characteristics of a Setting (Learning Environment)
   *Analyze setting characteristics and determine relevant resources and constraints.
   *Judge the accuracy, comprehensiveness, and appropriateness of a setting analysis.
7. Sequence Learner Outcomes
   *Select a procedure for sequencing learner outcomes appropriate to a given situation, sequence the outcomes and state a rationale for the sequence.
   *Judge the accuracy, completeness, and appropriateness of a given sequence of learner outcomes.
8. Specify Instructional Strategies
   *Select a strategy which is appropriate to information about the learner characteristics, resources, and constraints, desired learner outcomes, and other pertinent information and state a rationale for the selection.

*Judge the appropriateness of a specified instructional strategy for a given situation.

prevent a designer from exercising every competency, all professionally competent designers should be able to perform most, if not all, of the competencies when given the opportunity to do so.

4. The competencies reflect the skills of experienced, professional designers--as opposed to students, trainers or entry-level designers.

Figure 45-1 contains the present list of instructional-training design competencies. The competencies are not listed in a particular order; each is considered an integral component of the core skills possessed by a competent practitioner. The competencies list has appeared in Instructional Innovator, (December 1980, 25(9), 27-30), the Journal of Instructional Development (Fall 1981, 5(1), 14-15) and the DID Newsletter (August 1982, 13(1), 3-4).

The Task Force identified six ways in which the ID competencies list will be valuable:

1. It can provide experienced developers with a tool for self-assessment and professional growth;
2. It can provide a common set of concepts and vocabulary which will improve communication among instructional/training developers and other professional groups;
3. It can provide the academic and professional preparation programs for instruc-

Figure 45-1. (Continued)

9. Sequence Learner Activities
   *Specify a sequence of learner activities appropriate to the achievement of specified learner outcomes and state a rationale for the sequence.
   *Judge the appropriateness and completeness of a given sequence of learner activities.
10. Determine Instructional Resources (Media) Appropriate to Instructional Activities
   *Develop specifications for instructional resources required for explicit instructional strategies and learner outcomes.
   *Evaluate existing instructional resources to determine appropriateness for specified instructional strategies and learner outcomes.
   *Adapt existing instructional resources.
   *Prepare specifications for the production of materials where required (e.g., storyboards, lesson plans, script outlines, etc.).
11. Evaluate Instruction/Training
   *Plan and conduct a formative evaluation (e.g., trials with subjects, expert review, analysis of implementation considerations, etc.).
   *Develop a range of information-gathering techniques (e.g., questionnaires, interviews, tests, simulations, observations, etc.)
   *Generate specifications for revision based on evaluation feedback.
   *Judge the appropriateness, comprehensiveness, and adequacy of given formative evaluation plans, information-gathering techniques, and revision specifications.
12. Create Course, Training Package, and Workshop Management Systems
   *Determine the components of a course/training package/workshop management system and state a rationale for the selection.
   *Judge the appropriateness, comprehensiveness, and adequacy of a given management system.
13. Plan and Monitor Instructional Development Projects
   *Develop and monitor an instructional development project plan (including timelines, budgets, staffing, etc.) which is appropriate to the nature of the project and the setting.
   *Judge the appropriateness and comprehensiveness of a given instructional development project plan.
14. Communicate Effectively in Visual, Oral, and Written Form
15. Demonstrate Appropriate Interpersonal, Group Process, and Consulting Behaviors
   *Demonstrate interpersonal behaviors with individuals and groups and state rationale for using the behaviors in given situations.
   *Demonstrate group process behaviors and state a rationale for using the behaviors in given situations.
   *Demonstrate consulting behaviors with individuals and groups and state a rationale for the behaviors in given situations.
   *Judge the appropriateness of interpersonal, group process, and consulting behaviors in given situations.
16. Promote the Diffusion and Adoption of the Instructional Development Process
   *Select strategies appropriate for promoting the diffusion and adoption of the instructional development process in a given setting and state a rationale for the strategies.

tional/training developers with information for program development;

4. It can provide a basis for potential professional certification.
5. It can aid employers in identifying qualified practitioners;
6. It can provide a basis for defining the emerging field of Instructional Development.

CERTIFICATION AND OTHER PROFESSIONAL ORGANIZATIONS

As mentioned at the beginning of the chapter, two other organizations in addition to the AECT are showing some degree of interest in certification. The American Society for Training and Development (ASTD) is currently conducting a study to identify competencies in the training and development field (McLagan, 1982). To date, some eighteen training and development roles have been identified, e.g., program designer, strategist, needs analyst, task analyst, and evaluator. Here are the goals of the ASTD study: (1) to identify the accomplishments of persons who perform each role; (2) to identify the competencies necessary to produce the accomplishments; (3) to develop ratings scales for each competency; and (4) to identify/develop learning sources to help individuals build their competencies. Completion of the second and third goals will provide ASTD with the building blocks for a certification program if the organization chooses to move in this direction. There have been communications between ASTD and the DID Certification Task Force regarding joint cooperation, but no cooperative mechanism has yet been established.

The National Society for Performance and Instruction (NSPI) also has expressed interest in certification. The organization's long-range plan includes an objective to explore and recommend a certification process (NSPI Long-Range Plan, 1982).

In a refreshing demonstration of cooperation, the NSPI Standards Committee and the DID Certification Task Force agreed in 1981 to work together to explore the potentials of professional certification. One joint meeting was held in 1982; more are planned for 1983. The two groups have agreed to focus their combined efforts on the problem of assessment.

Assessment Procedures

The DID/NSPI (joint) Task Force decided early on that the possession of an academic degree or experience in the field was not sufficient evidence to insure competency. Hence, other forms of evaluating and documenting competencies were investigated. Attempts to develop paper/pencil tests failed when only knowledge and theory questions were generated. The problem was--and remains--to create an assessment mechanism which will permit observation and verification of **performance** as opposed to tests of knowledge or philosophy.

Some service occupations require practical examinations; for example, cosmetologists and barbers are usually required to demonstrate their competence in an on-the-job performance examination. Other professions are investigating the practical examination approach; in California, the law profession is exploring the feasibility of using performance measures to assess the competency of lawyers.

The National Board of Medical Examiners once required a "bedside assessment" during which applicants were observed and rated as they examined an actual patient. Lack of reliability, however, forced changes. The method used today is the problem-oriented, patient-management simulation. It is a paper-and-pencil simulation with a high degree of realism because the test takers have to perform as if they were working with a real patient. The approach has been criticized, though, on the grounds that it does not assess the physician's interpersonal and communication skills.

The DID/NSPI Task Force is currently investigating the viability of the assessment center concept as it is used in business, industry and government. The name "assessment center" is somewhat misleading. It does not refer to a place; rather, it is the name given to a series of assessments given to persons who seek jobs or promotions which require high levels of judgment and interpersonal skills. Candidates may be instructed to assume certain roles in a mock negotiation session, to interview a subordinate (played by an actor), or convince a committee (played by actors) to adopt a specific course of action. The in-basket simulation is also a commonly-used assessment technique. Trained observers monitor and evaluate the candidate's behavior throughout the various assessments and make judgments about the overall performance. The observers also serve as actors to play various roles when necessary.

The assessment center concept is appealing because (1) it does not rely solely upon paper-and-pencil tests, (2) it does not require the candidate to recall factual information, (3) it has high face validity and (4) it is performance-oriented.

The concept is not perfect, however. Complex simulations and exercises must be created in such a way as to permit the applicant to use many of her/his professional skills. This means the simulations must be reality-based and customized for the particular profession. Secondly, the observers must be extensively trained for their roles as assessors and actors. In the former case, there must be high reliability among the assessors' judgments; in the latter, the acting must be realistic and convincing. Third, the entire operation is labor-intensive and time-consuming, both in preparation and implementation. Fourth, only a limited number of candidates can be assessed at any one time.

Despite these drawbacks, the DID/NSPI Task

Force presently views the assessment concept as a viable alternative to the traditional paper-and-pencil assessments. Sub-groups of the Task Force are working to create simulations which are reality-based and require the candidate to exhibit many of the competencies presented in Figure 45-1. Once these are developed, they will be extensively tested to establish that they reliably discriminate between instructional/training designers and other professionals in other fields, for example, teachers, communications experts, media specialists, or evaluators. Even then, extensive field testing will be necessary to determine the feasibility of the overall concept.

Once an assessment procedure (whatever form it takes) is satisfactorily developed, then the Task Force will turn its attention to the administrative and logistical problems of establishing, coordinating and overseeing a certification program. When the Task Force will reach this point cannot be predicted at this time.

A PARTING WORD

Even if the DID/NSPI Task Force is successful in creating a certification process for instructional/training designers, it is not a fait accompli, for ultimately the profession will decide its fate. Recall that professional certification is a **voluntary** service; the members of the profession must **choose** to seek a certificate, or the program will fail before it even starts.

Regardless of the future of the certification movement, the act of self-examination which produced the competencies list, the value of the competencies list for professional development and for the academic preparation programs, and the insights gained while struggling to develop an assessment procedure, have and will add to our knowledge and perceptions of the instructional/training design field.

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B. WOMEN

Chapter 46

Women and Instructional Development: Patterns of Growth

Laurel Dickerson

The roles of minority groups in the professions are often different from those of other practitioners. Often the history and nature of a profession can be seen through an examination of the history of the development of these roles as displayed against the general history of the profession. The following chapter attempts to present such a view of the special role of women within ID.

INTRODUCTION

Never before in the history of literature have women been so obviously the focus of discussion, dissection, and debate. Research flourishes, novels proliferate, and magazines publish articles about women's roles, relationships, career patterns, histories, and futures. Add to the literature the legislation governing education, employment, credit, health, and family, and the Life of Woman becomes a subject of universal study and analysis.

Among the statistics, fiction, articles, documentation, and laws, a distinct difference can be discerned between the characterization of women in the literature of the past and of the present. Historically, women were characterized by their relationship to the pedestal--that is, whether or not they were upon it, falling from it, or sitting beside it. The "woman on the pedestal" period of literature, glorious in its own time, has evolved into what might be called the "up from the pedestal" period (from a book of the same title; Kraditor, 1968). No doubt scholars of literature, as well as others, will frown at this comparison, but it does help to characterize the literature of today. This characterization reflects women dealing with real problems, in real environments, with real people. "Coming up from the pedestal" suggests, too, that women are finding their own places in their own ways.

The following discussion proposes that the history of women as professionals and that of instructional development both display patterns of growth which are parallel and, ultimately, confluent. These patterns are represented both by the activities and by the literature reporting the results of these activities.

PROFESSIONAL STATUS AND PROFESSIONAL PRACTICE

Obviously, current literature is not dedicated exclusively to the discussion of women as members of the work force or of their participation in that arena. But a review of academic and popular literature demonstrates an immense interest in women and in their professional roles and status. This literature is legitimized, in part, by a respectable attention to documented evidence and scholarly analysis.

Literature about professional women can be classified generally by its focus upon either professional status or upon professional practice. Demographic studies relying upon traditional variables such as salary, career patterns, job satisfaction, education and experience represent the attention given to professional status. For example, Bernay (1978) focussed upon full-time faculty positions in higher education and reported that women held only 17 percent of those positions in four-year institutions. Citing Department of Labor statistics, Hennig and Jardin (1976) noted that less than five percent of the women employed in the national labor force held executive positions. A 1973 study found that 72 percent of women were employed outside the home sometime during their adult life. Yohalem (1979) studied the career patterns of professional women and reported that the reasons most frequently cited by these women for changing jobs included the increased application of professional skills and job reponsibilities.

Literature about the status of professional women, such as that cited above, can be applied across, as well as within, professional areas of practice. While this type of literature is useful to women in instructional development, it does not reveal any particularly unique perspective about them.

The literature which discusses the professional practice of women is frequently represented in popular publications such as *Ms.* and *Psychology Today*. This literature provides interdisciplinary guidelines, observations, and recommendations concerning a variety of subjects which influence professional effectiveness. While most useful as a resource, this type of literature does not provide any specific focus for women in instructional development.

Professional Practice and Professional Literature

There is, associated with any profession that body of literature which reflects the research and scholarship of the profession and which provides a major focus for professional practice. This literature reports the philosophical and theoretical frameworks which justify and structure a profession. It presents the results of research and experience which guide the professional in practice and encourage the application of new processes and methods. In sum, this literature supports the foundation upon which a profession and its practitioners continue to grow.

Professional fields such as medicine, psychology, economics, law, and education have long histories and, therefore, have produced substantial collections of professional literature. But many areas of practice within these fields have but recently developed. The professional literature for these areas is limited and there exists considerably less literature dedicated exclusively to professional women and their practice in them.

While components of the instructional development process have been in operation for decades,[1] there is general agreement that the area of instructional development was intellectually structured in the 1960s.[2] In light of the long history of other fields, instructional development can be considered to be a recently-developed area of practice with a relatively small collection of its own professional literature. But it can be seen from an historical review of this area that there are distinct and credible patterns of growth. Coupled with a review of women and their professional development, there emerges historical parallels which lend support to current practice.

PATTERNS OF GROWTH

The focus upon women in instructional development will begin with the 1960s; however, like the area itself, the philosophical and conceptual development of women's professional roles was founded upon the work of scholars who contributed to the literature long before this time.[3]

The patterns of growth to be discussed here are characterized, generally, by three stages. The first stage represents the establishment of philosophical and theoretical foundations for professional practice. The second stage reflects the strategies and organizations whose purposes were to provide information to and support communications networks for professional practitioners. The third stage is represented by the literature which ultimately reflects the legitimizing and refining of professional practice.

For each stage that is discussed, a parallel is drawn between the professional growth of women and the growth of the instructional development area.

The first stage in this pattern of growth involves the parallel development of a professional consciousness among women in general and among the scholars and practitioners who conceptualized the area of instructional development. This consciousness was expressed in the philosophical and theoretical foundations which were established for professional practice.

A review of the history of the 1960s reveals that women were defining their own status and roles within society at about the same time as the scholars and practitioners of instructional technology were defining the concept of instructional development. While this comparison is made not to suggest that one group influenced the other, it is interesting to note that both professional women and the original instructional developers were involved in the same process at about the same time.

The second stage in the pattern of growth took place in the late 1960s and early 1970s. During this time, women were struggling for recognition as competent, professional individuals able to assume responsible roles of their choice within society. At about this time, the early instructional developers, too, were struggling for recognition within their own institutions and associations. The results of these struggles in both cases were the formation of special interest groups and the identification of unique needs and abilities. Women's networks and organizations proliferated in an effort to gain visibility and respectable attention, and to communicate common concerns for professional practice; the early instructional developers were engaged in activities dedicated to similar purposes. For women, women's studies programs were implemented and caucus groups, both affiliated with and independent of professional associations, were established.[4] For the developers, graduate programs were revised and refocussed and groups such as the Division of Instructional Development were formed.

The first and second stages in the parallel pattern of growth for women and for the area of instructional development were characterized by striking similarities in generic focus and purpose, but the specific concerns to which women and the scholars and practitioners in instructional technology attended differed markedly. There existed little, if any, common ground regarding professional practice, particularly in the first stage. During that time, women were examining what was, for them, non-traditional professional areas. It would have been most difficult to examine the area of instructional development which, then, had not been yet clearly defined!

During the second stage of growth, women who were instructional developers were struggling with issues which focussed upon their roles within a broad range of environments from domestic to social to professional. Their concerns were highlighted by attention to salaries, to job discrimination, to professional leadership positions, and to sexist treatment. While these women were concerned individually with ID practice as it related to their jobs, the activities and subsequent publications they sponsored were not dedicated to the practice of instructional development. Women in instructional development were focusing, at that time, upon the broader field of instructional technology. Nevertheless, the second stage in the pattern of growth brought women and instructional development together. These were women who were also instructional developers, and they shared common concerns for their practice with their colleagues. In this sense, these women were members of the area of instructional development as well as members of a professionally broader-based group of professional women struggling for equity.

The third stage can be characterized best in terms of the literature which evolved throughout the pattern of growth. As was true with the first and second stages in this pattern, a parallel exists between women and those persons constructing the foundations for instructional development. And, as might be expected, the literature reflects the stages of growth themselves.

The feminist literature of the early stage of growth focussed upon the issues surrounding women's identity and their role in society. This literature represented a revision in the theoretical basis for human rights. (See, for example, Freidan, 1963; Kraditor, 1968; and Morgan, 1970.) Some observed that it was a literature concerned with survival.

Early writings about instructional development focussed upon a systematic process and proposed theoretical models for practice. (See, for example, Cochran, 1967; Corrigan and Kaufman, 1965; and Hamreus, 1972.) Heuristics were developed to guide the professional in the practice of this new area (Haney, Lange, and Barson, 1968). Some also described these heuristics as guidelines for survival.

The second period in the development of the literature reflected the need for communications among professional women and among the early practitioners of instructional development.[5] It also provided platforms from which these women and, similarly, these developers could raise issues, clarify concepts, discuss problems and propose solutions.

For women, the popular magazines mentioned earlier were created, and many of the professional caucus groups developed their own newsletters. During that time it was not uncommon for members of Women in Instructional Technology (an AECT women's caucus) to receive literature from the women's caucus in the National Association for Educational Broadcasters, Women in Communications, and the Media Report to Women, as well as their own publication, The Platform. Many professional associations sponsored surveys and established affirmative action committees to collect data and study the status of women within the professions (Caput, 1976). A review of professional journals during this period reflects increased attention to the concerns of and about women. Topics such as the use of sexist language in academic and professional materials, sex discrimination in academic programs, and professional skills as a measure of competence were not uncommon. A review of convention schedules during this period indicates a marked increase in the numbers of women presenting papers at professional conventions. a primary focus for women was provided by WIT in its efforts to develop programs for presentation at the AECT national conferences. Beginning in 1975, when one speaker was sponsored with "out-of-pocket" expenses, through 1980, when the WIT program included workshops, joint sessions and film festivals, and when WIT situated its members on boards, task forces, and committees, the organization has provided countless opportunities for women to actively participate in professional activities.

For instructional developers during this period, similar activities were taking place and were reflected in the literature. The need for communicating with members of the profession and informing them about the practice of instructional development resulted in a number of publications. The work of Davis, Alexander, and Yelon (1974), Gerlach and Ely (1971), and Gagne and Briggs (1974), for example, lent considerable credibility to the developing practice. The AECT Division of Instructional Development (DID), established in 1970, served as an organizational sponsor for much of this literature. A series of papers attempting to define instructional development was developed for presentation during an AECT national conference (Briggs, 1971; Gustafson, 1971; Hamreus, 1971; Heinich, 1971; and Merrill, 1971). These papers were later published as Occasional Papers (Davies and Schwenn, 1971) and distributed to all DID members. Stomus (1972) conducted a review of many theoretical models of instructional development and his documentation of this review was distributed with the sponsorship of the division. The DID Newsletter, first published in 1975, began to communicate information about the division's activities and concerns on a regular basis. Also during this period, AECT dedicated an entire issue of Audiovisual Instruction (1974) to discussions of instructional development in an effort to inform its more broadly-based readership.

The third period in the development of the literature reflects, most suitably, both the third stage in the pattern of growth for women and that for instructional development. This third stage is most significant because it reveals that the issues upon which women are beginning to focus are confluent with those upon which the field of instructional development is also beginning to focus. In effect, the patterns of growth reflected by parallel stages of development of women and of their professional practice are no longer separate patterns (see Figure 46-1).

The focus of effort is now upon the profession and upon the practitioners responsible for it. While traditional concerns for equity still exist and require attention and action, women instructional developers are focusing upon aspects of professional practice specifically related to instructional development.

The literature of this third stage in the pattern of growth clearly reflects attention to two general areas: (1) the legitimation of the professional area and (2) the refinement of professional practice.

In 1977, the first issue of the Journal of Instructional Development was published. Silber (1977) noted that the purpose of the journal was "to contribute to the analysis and improvement of instructional development in the form of quality, professionally-oriented articles, and to stimulate communication among theoretically- and practically-oriented instructional developers."

With the publication of JID came the recognition of instructional development as a legitimate practice and area of study, and of instructional developers as legitimate, professional practitioners. Furthermore, JID was the first publication of a periodic nature which focussed in a singular fashion upon instructional development. Until this time, there existed no unique "vehicle for the dissemination of information about instructional development nor for communication among instructional developers" (Silber, 1977).

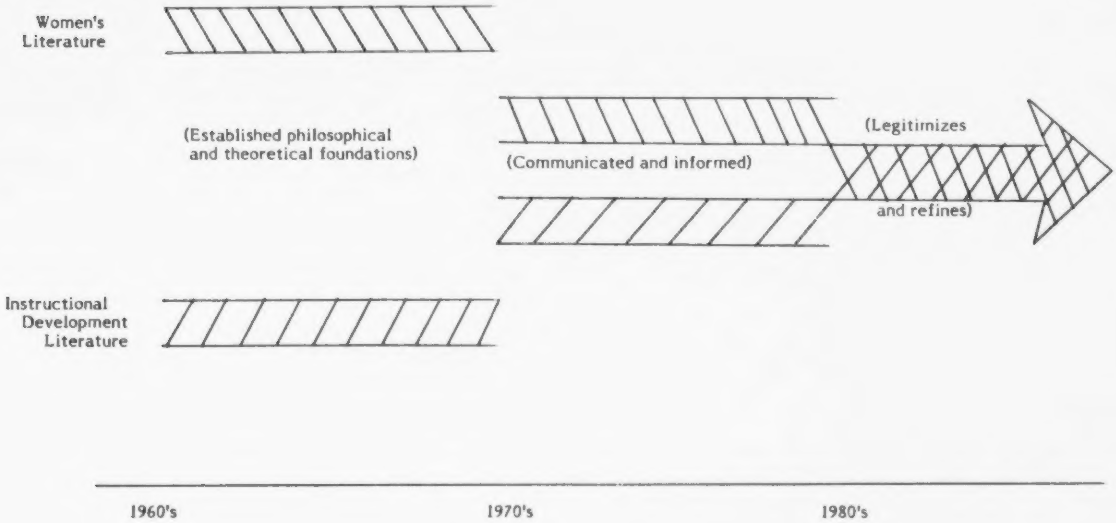
Women's Literature
(Established philosophical and theoretical foundations)
(Communicated and informed)
(Legitimizes
and refines)
Instructional Development Literature
1960's
1970's
1980's

Figure 46-1. Parallel between the literature and professional practice for women and instructional development.

In 1978, Women in Instructional Technology and the Division of Instructional Development sponsored a joint session during the AECT national conference titled "Male and Female Instructional Developers: Power, Politics, and Personality." This session was the first public effort between the two groups and reflected the views of instructional developers representing both groups. Two major themes highlighted the session. The first theme focussed upon the legitimation of women's roles as instructional developers. Note was made that "it is very important that [women instructional developers] attend to this whole notion of role legitimation: what it means, what the implications of achieving it are, and, certainly, what the implications of trying to maintain it will be" (Bratton, Cannon, Dickerson, and Poorman, 1978). The second theme of this joint session was highlighted by a series of recommendations for successfully conducting encounters between the instructional developer and the client. The recommendations focussed upon the developer's style and suggested that (1) the styles of both the developer and the client must be understood in order for an effective developer-client relationship to exist; and (2) the developer's style will change with each client and within each relationship established between the developer and the client during the instructional development process (Bratton, *et al.*, 1978).

The joint sponsorship of *this* session clearly marked the merger of the concerns of women and with those of instructional development. The focus upon women's roles and upon developer styles reflected those very concerns for legitimation and refined practice shared by both professional women and by the general professional audience of developers.

Instructional Development: The State of the Art (Bass, Lumsden, and Dills, 1978) was published "to provide step one toward a description of the state-of-the-art in instructional development ..(and)..a look at many factors which should be considered in the growth of the...field...." This book reflected the range of concerns influencing instructional development and its professional practice. Exemplifying the concerns of the third stage of the pattern of growth, this publication represents an attempt both to legitimize the instructional development area and to refine its practice.

The issues presented by Bass, *et al.* (1978) are focussed clearly upon the area *of instructional* development as it relates to higher education (see, for example, chapters by Abedor and Sachs, Durzo, Bratton, and Lawrason). And in a debate between Silber (1978) and Gustafson (1978) on the future of instructional development, Gustafson excluded the non-traditional (business, industry and military) arenas of practice from his critical assessment of that future. He directed his attention to presenting a rather bleak forecast for instructional development in the educational arena and concluded that, without a serious re-examination of the "basis of existence and modus operandi" of the profession, it will be unable to survive (Gustafson, 1978). Gustafson (1979) reinforced this forecast in response to his critics (Wallington, 1979). He said, "Frankly, I don't think the ID process has much of a future anywhere if it can't speak both to effectiveness and efficiency.... To deal with the efficiency, we need an entirely different economic model accounting for a variety of input, process, and output variables."

The identification of the future of instructional development with its future in higher education was countered by, among others, Silber (1978), who noted that "at present, there is no one professional home for instructional development as a field and instructional developers as professionals." Wallington (1979) responded to Gustafson's focus by saying, "I can envisage individual instructional developers and the field of instructional development proving its worth in areas **other than** the educational establishment." He was speaking of business, industry and the military areas. There is, in fact, an increasing trend toward practicing in these non-traditional arenas, rather than in the traditional, educational arena, and this has become an issue of considerable debate and discussion within the profession. In the effort to legitimize their practices, instructional developers appear to be turning toward non-traditional arenas (Moore and Cline, 1980).

The movement toward business, industry, the military, and the health-related fields, has been supported by the results of a recent study of graduate education (Patridge and Tennyson, 1978-79). The authors conclude that "competencies and content emphasized in graduate study are common to a number of programs. For example, the master's degree is intended to prepare students for employment as instructional developers in business and industry."

This recent attention to the non-traditional arenas for professional practice is of considerable interest both to women and to instructional development. Caput (1976) noted significant differences between the distributions by age of women and men in the broader field of instructional technology, but reported that "males and females appear to be equally represented in the 'under 35' group, which may suggest that as many women as men are students entering the field." If these findings can be applied to women in instructional development, then the new generation of female instructional developers, like their male counterparts, are participating in, maybe even directing, a stage of professional growth which is expanding its base of operations. The implications of this expanded base can only be speculated upon at this early point in time; however, Moore and Cline (1980) have reported the preliminary results of a survey of women and men who practice instructional development. They suggest, "It would appear that men and women are largely satisfied with their positions in instructional development. Although there are discrepancies between men and women in terms of salaries, no blatant results were found to indicate that women were taking a back seat to their male counterparts in this field."

The third stage in the pattern of growth for women and men and instructional development continues to focus upon refining practice. If Gustafson's (1978, 1979) bleak prediction for the future is taken seriously, then the need to refine this practice is essential for survival. His suggestion for the development of an efficiency model is in line with the demands of both the educational and the non-traditional arenas. In fact, there now exists in the literature an attention to developer style which suggests that professional practitioners are concerned about being more effective. While this attention might highlight only one aspect of an over-all efficiency model, it does focus directly upon the role of the practitioner in that model and upon that person's competence and efficiency in applying the instructional development process.

Silber (1978) notes that additional skills, "related to the way an individual processes information and interacts with people (might) make the difference between a successful instructional developer and a not-so-successful one." The belief that the developer's style influences the outcomes of the ID process is not new. Davies (1975) and Price (1978), for example, directed attention to the relationship between the developer and the client, as did Cannon and Poorman (1978) in their discussion of female instructional developers. More recently, Sneed and Bruce (1980) conducted a survey of instructional developers in an effort to identify the existence of any relationships between styles of consulting and of leadership. They categorized consulting styles as directive, non-directive, and collaborative. Leadership styles were categorized as person oriented, task oriented, and a combination of person and task orientations called "shared leadership."

The Sneed and Bruce (1980) study revealed no significant relationships between consulting and leadership styles. Moreover, respondents indicated that there was no particular preference for any one consulting style. The authors concluded that consulting styles vary according to the situation in which instructional development takes place, but encouraged continued study in an effort to develop a contingency model. This study is significant because it reflects an androgyny of professional practice; that it, women and men are reflecting no particular differences in the ways in which they approach the application of instructional development. Furthermore, the results of the study indicate that instructional developers, in general, adapt to the situation and to the client, depending upon the requirements and perameters of the tasks and of the people involved to determine their styles. This latter observation may lend additional support to the movement of instructional developers toward the non-traditional areas of practice. It would appear that this adaptive quality supports professional practice in many arenas. Calling attention to the need for refining this practice, Sneed and Bruce (1980) urge that future research be concerned with studying this adaptiveness under "the full range of contingencies that shape our actions and determine our effectiveness" as instructional developers.

The patterns (plural) of growth for women and for instructional development have now merged into a pattern (singular) of growth for women instructional developers. This pattern is reflective of the profession itself. As women developers work to legitimize and refine professional practice, so, too, is the profession legitimized and refined.

CONCLUSION

It is fitting, perhaps, and certainly convenient, that women as professionals and the field of instructional development display similar patterns of growth. Each pattern originated in the turmoil of the sixties. During that time, many fundamental values were being questioned within society and significant issues were being raised within the profession. The establishment of a societal and professional focus for women occurred concurrently with the establishment of an applied and professional focus for early instructional developers. These patterns and foci have now merged, and this will serve to strengthen the profession.

The concerns and problems facing professional practice in the area of instructional development will continue to reflect the issue of legitimacy and the process of refinement. Finding a "home" for instructional developers (Silber, 1978) and constructing a contingency model for practice (Sneed and Bruce, 1980) will surely reinforce the value of the profession. There is no question as to the seriousness and legitimacy of Gustafson's (1978, 1979) forecast; it is qualified by the contention presented here, that women are coming of professional age at the same time as is the area of instructional development. This "coming of age" concept is wedded to the conviction that the value of the profession is worth the effort required to legitimize and refine a practice which can never remain unchanged. In this sense, the professional developer will never be able to fully define instructional development. But the quality of change reflected in this observation is the most legitimate characteristic there can be for a profession dedicated to change itself.

The environments within which the instructional developer can practice are limitless. The adaptive competence which the instructional developer can apply is, in fact, that very quality of practice which will insure the future of the area and of the professional who is responsible for it.

REFERENCE NOTES

1. For example, a review of the Motion Picture Project, begun in the 1930s and supporting almost ten years of research and develop-

ment, reveals the application of many of the fundamental principles underlying instructional development practice today. (See Hoban, Hoban and Zisman, 1937; Hoban, 1942; and Hoban, 1946).

2. This is not to deny the early work of such scholars as William H. Allen, James D. Finn, or Charles F. Hoban, Jr. In fact, their scholarship and the literature they authored prior to the sixties established the foundation upon which the conceptual development of the area of instructional development was based.

3. See, for example, the work of the following: Simone de Beauvoir (*The Second Sex*. New York: Knopf, 1953); Marion Reid (*Woman, Her Education and Influence*. New York: Fowler's and Wells, Inc., 1848); and Ida Tarbell (*The Business of Being a Woman*. New York: Macmillan and Company, Inc., 1915).

4. Caucus groups of one sort or another existed in virtually every professional organization during this stage. For those organizations whose memberships included women and men, a direction similar to that taken by Women in Instructional Technology (WIT) was taken. Established originally in 1974 as a caucus group of women whose membership was with AECT, WIT became a formal affiliate member of the association in 1979. Other caucus groups, unlike WIT, disbanded once the parent organization became aware of and active in resolving the issues being raised. Still other groups disintegrated from insufficient member energy and lack of support from the professional association.

5. A review of the history of women's activities in AECT in the last 20 years reveals that a strong need for communications existed at this time. This history begins in 1974 at a time when professional women in general, and AECT women in particular, were experiencing many frustrations within their areas of professional practice. The author proposes that without attention to these frustrations at that time, the professional development of women in AECT would not have been able to keep pace with that of their male colleagues.

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VIII. FUTURES

Chapter 47

A Futures Perspective on Instructional Development

Carol D. Blalock

Instructional developers have for years been predicting the future of the ID movement. Some writers have predicted a bright future, some have predicted the demise of the movement. Perhaps those who have been making the analyses are too close to the action to see all of the ramifications of the system(s). This chapter presents a futurist's perspective on ID. Perhaps we should know how our profession is viewed by someone not directly involved in the delivery of the services we normally provide.

INTRODUCTION

The future of instructional development or of any other educational activity cannot be predicted by simply extrapolating from existing trendlines. Drucker (1968) examined the development of Western culture in the last half-century and termed this period an "Age of Continuity," the period showing the least change in the last three hundred years in terms of agriculture and world commerce. During this time of continuity, economic growth was extensive, particularly in countries which were economically well-developed before 1913. The foundations for this were so solidly established by prior generations that this growth has survived the trials of the last fifty years. We are now, Drucker says, in an "Age of Discontinuity" in terms of technology and the world economy. It may be a great age. However, he predicts that it will be a time of many changes, since the foundations previously understood and relied upon have shifted under our feet.

In a rapidly changing world a field as technology-dependent as instructional development (ID) is also changing. The concept underlying ID reflects a network or a system of individuals, functions, and influences in a state of dynamic equilibrium. Abedor and Sachs (1978) have provided a three-part conceptualization of the centers, agencies, and programs which have as their goal the improvement of teaching: Faculty Development (FD), Organizational Development (OD), and Instructional Development (ID). Faculty development emphasizes the shaping of the skills, methods, understanding, knowledge, and techniques of each faculty person.

Organizational development strives to optimize the organizational environment, form, or procedures under which learning and instruction take place. Instructional development, in contrast, pinpoints the systematic design, advancement, practice, and evaluation of instructional curricula including lessons, materials, and courses. People and organizations engaged in instructional development must operate within intricately-balanced configurations which have characteristics influenced by instructional change (Rogers and Shoemaker, 1971). Thus, ID, as a field, both conditions and is conditioned by changes in the state-of-the-art of many disciplines, such as learning theory, curriculum development, cognitive and behavioral psychology, computer and data-processing technology, and electronic communications.

In assessing the probable future of ID we find ourselves examining three questions: (1) What are the probable developments in instructional technology which will determine the instructional developer's armamentarium? (2) What are the probable developments in our understanding of cognition and learning which will help us to diagnose needs, identify learning styles, and prescribe learning strategies? (3) What are the social trends which will determine the future demands for instructional development and which will control the availability of resources for education?

DEVELOPMENTS IN INSTRUCTIONAL TECHNOLOGY

In our society education is perceived as a pervasive influence serving the needs of all persons in many contexts. The keynote speaker at the "First National Conference on Education and the Future" in Houston, Texas, (McHale, 1978) said that "new developments in telecommunications and computer technology may be as significant for education as the Gutenberg press." Developments in technology that may affect education include: micro-computers, micro-processors, bubble memory, lasers, holography, optic fibers, satellite-to-rooftop communications, video discs, charge-coupled devices and the application of electronic technology to communication (Lewis, Harrison, et al., 1978). A new age may be arriving in education with the use of electronic technology; however, the increased use of technology does not assure the improvement of instructional development specifically or of education generally. Nonetheless, it has been shown that telecommunications can be used in instructional programs as a way to cut costs under certain conditions (Dede, 1980).

Instructional technologies in use at the present time which could cut costs include home television, instructional calculators, home terminals for large computers, videodiscs with or without personal computers, and electronic communication and information processing. These five educational technologies illustrate the possibilities available in adaptation of the teaching/learning model (Dede, 1980). Learning through home television could be accomplished without a computer link-up by creation of a national programming system providing programs analogous to "Sesame Street," which has revolutionalized preschool television programming. The combination of carefully selected curricula appropriate to specific cognitive and experiential levels might be combined with entertainment. Curricula designed for each age-level (including adults and the aged) could be released via multiple-channel cable television. Approximately 95 percent of all households have television at this time and cable television channels, already widely available, should be available soon in almost all areas of the nation.

An advantage of national television programming would be that all citizens might have the opportunity to benefit from standardized learning experiences on such topics as citizen literacy,* instruction for all learning levels being produced using individuals with high-quality acting talent. such programs may be supplemented by paraprofessionals who would lead small-group discussions designed to encourage learners to make the televised materials their own through reaction, internalization, and personalization. A major strength of television programming is its capability for repetition, which could replace much of the current teacher-led socialization at all age-levels. Thus, time currently spent on "real world coping skills" could be lessened. Further savings might also result from savings in travel and facilities. However, production expenses will always be high for technological instruction of this kind; therefore, to be cost-effective, a large audience would be required.

Inexpensive and effective calculators can be programmed for use in the tutorial approach to instruction according to Dede (1980). These calculators can perform semi-sophisticated, computer-assisted instruction in several modes. In the tutorial mode, the calculator presents basic material, questions the learner, and corrects errors. The inquiry mode in which learners request a specific fact and receive the answer is another instructional mode for calculators. Dialogue with the calculator involves a general question which results in a complex answer. The final mode of calculator-supported instruction mentioned by Dede (1980) includes both explanations and interpretations. Complex learning is presented and a general response is requested. The costs of such instruction would be quite reasonable, but the relative economy of the mode may not be adequate to override the possible depersonalization which could be built into such a system, or the risk of a programming error resulting in people learning the same error nation-wide. Content bias is also a possible risk.

Home terminals for large computers, according to Dede, are the means through which a large central computer could deliver programs into homes utilizing cable television. Such a network "sets up a multiple-person, interactive, artificial-intelligence-based learning simulation" (1980). An advantage of this instructional system is that learner response on the home terminal results in a message being returned to the central computer over the cable. Creativity and higher-order cognitive skills, as well as interaction, are features which make the use of this instructional technology attractive to learners. Input would be typed onto a home keyboard and relayed to a large computer. Skills to be acquired include group problem-solving, computer programming skills and distance-communication skills. Research has shown that the motivation and involvement-level of learners using this instructional technology is very high. Although costs for personnel, travel, and facilities might be saved, developmental costs would be extremely high. Dede states that "artificial intelligence software can require up to 10,000 hours of programmer time for each hour of instructional time produced" (1980). The high production costs would require a large learning population in order to be cost-effective.

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*Citizen literacy refers to an awareness of those public issues of critical importance to the national citizenry.

The fourth example of instructional technology to be considered involves videodiscs coupled with personal computers. According to Dede this technology involves videodisc images-with-soundtrack interacting with microcomputers. Electronically-recorded material is presented, reacted to, and modified depending upon learner response. With this system the response-range is more limited and fewer variations are possible than is the case with the larger central computer system. As with other technological instructional possibilities, production costs are enormous while costs for actual use would be quite small. According to Hunt (1980), educators see the personal computer as a "stand alone, small, interactive microprocessor with great potential and versatility." He believes that the work of Orlosky and Smith (1972) indicates that personal computers will not survive as classroom aids. However, the business world envisions the personal computer as part of a system for home and business information because it includes the elements of television, language laboratories and teaching machines, and is a computer. It can be seen as related to cable TV and the telephone in that it affords new dimensions personally and functionally.

Electronic communication and information processing is a fifth possibility as an aid to instruction. Included within this category is electronic mail, computer conferencing, computer search, and information processing options, all of which may be means to increased educational efficiency (Dede, 1980). Electronic mail relays ideas swiftly and inexpensively to distant locations and can act as support for the development of a statewide or national networking system. A computer conference allows people to act as a group over long distances and within self-selected timeframes. Computer searches can acquire needed information within extremely short timeframes allowing library and research costs to drop. Information processing (word processing) assists in the writing and the editing of manuscripts. These technologies aid in reducing professional "busy work" and their costs must be examined in light of institutional priorities.

The technology for the five instructional possibilities mentioned is now in existence; however, only limited software is presently available. Joseph (1979) in his speech to the World Futures Society Education Section discussed computers of the future with respect to information storage capacities. "The Silicon Revolution" would include first and second-generation electronics. He saw the first generation as including "smart" machines such as books-on-a-chip, courses-on-a-chip, doctors-on-a-chip, managers-on-a-chip, and politicians-on-a-chip, with each chip holding 16,000 bytes of Random Access Memory, or 16,000 items. His projection of "people amplifiers" for the second generation includes "smart" systems-on-a-wafer, schools-on-a-wafer, or libraries-on-a-wafer. The whole movement to high-speed integration technology was seen by Joseph as supported by hardware development. However, he felt that 10 to 15 years would be required to debug this hardware. Education will clearly be impacted by the developments in information storage, as will instructional development, but neither Joseph nor any other futurist can be certain what this impact might be.

Norris (1977) believes that educators should assemble and configure various technologies into a system "that does what the present educational process does" but accomplishes this with a capital-intensive rather than a labor-intensive process. His suggestion for national and international networks includes computerized control with the main method of delivery being computer-aided instruction involving computer-aided videodiscs, touch input, and audio input and output. Computer-aided and computer-managed instruction would form the nucleus of the integrated terminal subsystems. Norris recommended the PLATO system of Computer Based Education for use because of advantages which include patience, personalization, versatility, and high-quality delivery. The PLATO system uses many forms of media and structures while being applicable to any knowledge-based information exchange. The interaction with individuals or groups, audio and visual responsiveness, and extremely large memory make PLATO a possible choice for a learning-center network. The learning-center network would represent the cooperative efforts of business, government, and educational institutions, and would offer a wide range of curricular materials. The cost for the development of one network could be up to one million dollars and a large target population would be necessary in order to justify the cost. The many obstacles to the marriage of education and business in forming a network of this kind must be considered. Teachers may perceive technology as a threat to their jobs, or a more general resistance to innovation in education may occur. Additional concerns include quality control, the public's dislike of the idea of monetary profit in education, and/or the desire to preserve individual identity. The rate at which obstacles to the use of technology in educational design are overcome depends upon the rate of attitude changes among educators, administrators, and the public.

Morgan (1978) believes instructional development is about two decades old. Instructional development, instructional systems development, instructional design, and educational engineering are all labels used to describe instructional development. Apart from variations in name preference, a look at the origin, current status, and the future of the field might be useful. Instructional development, according to Morgan, received its strongest impetus from the work of B. F. Skinner and others on programmed instruction (1958). He believes that Skinner's work caused the convergence of three disciplines: communication, management science, and behavioral science. For many people, the field of communications including home television, complex communication networks, message transmission, information storage and retrieval, as well as other technologies, represents the body of instructional development. For many years, overhead projectors, slide/tape machines, motion-picture projectors, and radio and television have been a familiar part of the instructional process. These communications systems, those of the past and those of the future, potentially can be integrated to form a single instructional package having great impact upon the learner. These tools have been useful, and can be more so in the future; however, research demonstrating their impact upon the quality of the learning experience has so far been limited. Unless communications specialists join with behavioral scientists to apply the principles of learning to the design of the framework, sequence, and type of information to be transmitted to the learner, instructional development cannot become a "mature field" (Morgan, 1978).

DEVELOPMENTS IN COGNITION AND LEARNING THEORY

Current and future developments in our understanding of cognition and learning which will help us to diagnose needs, identify learning styles, and prescribe learning strategies can be of great value to instructional development. Psychologists have intensively explored the learning process for over fifty years and numerous alternative theories have been developed. The gap which exists between theory and practice has been slowly bridged in terms of improved instructional practices. In the 1930s Luria (1980) sought to document the primitive mind by working with preliterate peasants in remote areas of Uzbekistan. Luria's interest was two-fold: he wished to document the operations of the "primitive mind" existent in people who led a simple life and had no education; and at the same time he wished to seek educated individuals for comparison in order to determine both the degree and the manner in which primitive cognition is replaced or refined by more advanced forms of reasoning. Luria's form of research for obtaining responses was similar to the probes used by Piaget in his work with children. Luria demonstrated again and again that questions answered by people from Uzbekistan were answered in a manner that differed cognitively from those answered by educated Westerners or Easterners. The peasants' answers revealed general insensitivity to abstract forms of classification. Resistance to reasoning through language was evident to Luria. Only those people who had entered school had sensitivity to hypothetical, linguistic contributions, or to the superordinate constructs of "umbrella" categories. Although Luria's work was in many ways equilivalent to that of Piaget in the Western world, because of Soviet politics, he could not publish his results when they were obtained. He finally published his findings in 1960, almost thirty years after the initial work had been done. Gardner (1980) summarized Soviet psychology in relation to Western psychology. Pavlov and Bekhterev viewed the mind primarily as Skinner has, as a fundamentally physical reflex with nothing special about consciousness, will, or intention. Another, equally reasonable point of view emphasized consciousness and other special features, and questioned whether an objective science of psychology was achievable. Luria, Vygotsky, and their associates thought that a fusion of these two traditions was achievable. They wished to find an objective basis for the highest of human achievements (Gardner, 1980). The study of primitive forms of mentality created a pathway from reflex to thought, from elementary perception to abstract language, and from reaction to planning. Luria and his associates suggested that the single factor that made man special was his surrounding cultural context.

Kelly's personal-construct theory (1955) is a theory of cognition based upon a unique set of assumptions regarding the nature of mankind and of the human universe. Kelly's theory develops Luria's observations concerning the various levels of human constructs and their interrelationships with each other. Three assertions are made by Kelly in relation to the universe: humanity knows the universe to be real and not the result of someone's imagination; humanity knows that the universe can be understood only by repeated encounters over a period of time; humanity knows all events are interrelated.

Kelly's assumption that the universe contains real events and objects is complemented by his assumption that a person's internal events are also real. Thoughts about external objects or events have an internal reality as authentic as the happenings themselves. Kelly believes that our knowledge about the universe is determined by the extent to which we interpret it. For individuals, this interpretation gradually approaches by successive approximations a true picture of events. Unlike purely subjective existential theorists, Kelly accepts the possibility of accurate knowledge of objective reality. Kelly's theory views the human being as trying out interpretations or constructions for their predictive validity in the world s/he is beginning to understand.

Kelly believes that some aspects of existence can only be made comprehensible through the notion of time. Behavior is explicable only if seen in the context of the future as well as in that of the present and of the past. Kelly's personal-construct theory includes the notion of an integrated universe which is consistent with the development of a system of ideas designed to bring coherence to one's world-view. He sees people as constantly trying to construe relationships where there were none perceived before (Bannister, 1968).

Kelly visualizes humans as distinguished by their ability to not only respond to life's events but also to represent their environment. Personal-construct theory is based upon people knowing the world by means of the constructions they place upon it. Humans are bound by events to the degree that they have the ability to construe them. Kelly's philosophical position has been called constructive alternativism (Bannister, 1968).

Personal-construct theory (Kelly, 1966) has demonstrated the usefulness of looking at human and scientific endeavors as sharing relevant similarities, in that in both people pinpoint issues, observe issues, become intimate with problems, form hypotheses, test hypotheses, relate results to expectancies, control investments so that they can understand what leads to which outcomes, produce generalizations, and broaden dogma in view of experience. Kelly's (1977) unique contribution to psychology was the introduction of a single language for explaining human processes, making the psychological nature of scientific inquiry capable of providing new insights both into the potential of man and into the nature of science. Kelly did not claim to have reached a total understanding of human process, but he did feel that the idea of "man-the-scientist" was worth exploring. Recent research using Kelly's personal construct theory and repertory grid analysis has revealed that when perceptions and values of three groups were compared in relation to a current social problem, many perceptions occured in common (Blalock, 1980). When groups can agree on perceptions, they can be led to discuss, clarify, and develop valuations related to those perceptions. In the study above, only one construct represented a shared value among the three groups, indicating the existence of functionally-defined group differences. Although specific perceptions will be valued differently by the different groups, the existence of common perceptions and of common dimensionalities of valuing should greatly facilitate communication. This approach to curriculum planning and educational strategy is based upon a recognition of the difficulty of comprehensively informing through a broad-based community education program. Such methodology provides a way to identify commonalities and differences which contribute to group identity. Any instructional development program which ignores the valuational aspect of educational programs will fail in achieving effective communication with the membership of those groups whose values differ significantly from the values assumed in the curriculum design. Research has described a paradigm for mapping such values with regard to social issues (Blalock, 1980).

Educators have traditionally accepted responsibility for the transfer of information, the organization of that information into rational, hierarchical structures, and the use of knowledge as a basis for ethical participation in the democratic process. Historically, the application of these responsibilities were restricted to the young; but an emerging role of education is the extension of these functions to all of society. If curriculum is the plan by which education functions, then workers in instructional development as well as in curriculum development must find methods to develop organized knowledge and thought and present it to specific target populations. While a variety of learning theories are available which provide specific strategies for implementation of the educational process, there is need for a unifying theory of perception and thought which transcends differences in strategy. Personal-construct theory provides us with that unifying picture. It permits the identification of various levels of intellectual functioning for which the educator must take responsibility. Thus curriculum planning can begin with the transfer of factual information, proceed through the development of organizing constructs, explicitly facilitate the testing of constructs against reality, and culminate in the evolution of high-level supraordinate constructs which serve as guides for moral action. The techniques used in research deriving from Kelly's personal-construct theory can be used to visualize the status of an individual or group at any of these levels, thus providing baseline data upon which to base planning.

Another application of learning theory, programmed instruction, had its first debut in the 1960s; while many programs did not work very well, others did (Morgan, 1978). It was possibly the first time when some of the conditions of human learning were influenced by a degree of experimental control. Programmed instruction fell from popularity quickly for various reasons; however, a large quantity of materials remain in use. Morgan (1978) states that for the first time, educators in significant numbers were emphasizing the outcomes of education instead of the processes. Additionally, educators became more aware that student failure might relate to teacher failure or to the failure of instructional materials. Interest in instructional development increased as a result of programmed instruction, and creative responses were devised to meet this interest.

Instructional development grew with the advancement of learning theories into the management-based systems of the present (Willems and Brown, 1980). Curricula of this type identify specific skills, knowledge and behavior needed by students. The conditions necessary for performance and the minimum acceptable level of attainment are also defined. Some high schools and grade schools require demonstrated competencies as prerequisites for graduation or for movement to the next grade. Although possessing some value, there are limitations to this type of curriculum. The most often-mentioned criticism at this time is that competency-based curricula stifle creativity. Supporters of competency-based curricula have not answered this question to everyone's satisfaction at present. Medawar (1972) offers a perspective which might bring both sides closer together. He states that in "the conception of the scientific process, imagination and criticism are integrally combined. Imagination without criticism may burst into a cosmic profusion of grandiose and silly notions. Critical reasoning, considered alone, is barren. The romantics believed that poetry, poses, the creative exploit, was the very opposite of analytic reasoning, something lying far above the common transactions of reason with reality. And so they missed one of the very greatest of all discoveries, of the synergism between imagination and reasoning, between the inventive and the critical faculties." Viewed in this way, competency-based education can be more readily accepted, but accepted only in areas appropriate for the thinking processes of human beings.

Willems and Brown have classified thinking into three types, and have discussed these in terms of competency-based curricula. Type I thinking involves instinctual and automatically-learned responses, spoken of as "unconscious reactions." Type II thinking involves "conscious activities" which make up most of today's competency-based curricula. Examples of Type II thinking are rote learning, drill and repetition. Sometimes these are called "recipe-type" responses. Type III thinking depends upon Type II thinking and synthesizes all thinking into an understandable whole. Examples include speculation, reflection, theoretical production and inspiration. Willems and Brown state that most really good ideas do not start with logical thought but begin from intuition. Later the ideas are tested by logic. Creativity functions as the delicate relationship between rational and intuitive thought. Most competency-based curricula in schools have relied upon Type II thinking. Type I thinking is usually not considered to be the school's responsibility and Type III thinking is seldom provided for or even encouraged in a competency-based school curriculum. Civilization is challenged by Type III problems which require synergistic outcomes if solutions are to be found. Problems such as food-population imbalances, energy, environmental pollution and lack of international understanding are some of the Type III problems referred to above. Attempting to solve Type III problems with Type II solutions results in spurious solutions based upon logic and rationality. Thus, Type III thinking is critically needed. Natural evolution no longer determines or defines people; they now are capable of selecting the most appropriate learning environment within which to acquire their own critical survival skills.

As a result of recent studies in cognitive learning and memory, researchers in cognition have demonstrated considerable progress in understanding the cognitive processes, such as selective attention, imagery, verbal encoding, memory and retrieval (Paivio, 1971). Recent research in artificial intelligence and computer technology leans toward a cognitive emphasis. Interest in cognition is not new. Aristotle's model of memory stated that we remember information only by forming images of it; and that images may be recalled through sequential ordering and association with one another, by applying the principles of similarity, contrast, and contiguity (Aristotle, 1964). Wittrock (1978) mentions three relations existing between education and cognitive processes in the brain. First, recent brain-research findings suggest that process-oriented paradigms can result in an understanding of ways in which human learners construct meaning from instruction. Second, recent brain-research findings are consistent with cognitive models of learning and memory. Third, human brain-research findings are consistent with the ancient art of teaching and its ideas.

An interesting summary of brain-research findings points out that the brain actively constructs models of the world (Jerison, 1977). Luria and Trevarthen (1973, 1974) found that human brains actively select, transform, organize and remember information. Learners were seen, not as passive receivers of information, but as actively constructing personal meanings from this received information. One outstanding finding of recent research on the human brain demonstrates that its cortical hemispheres usually organize and encode information in different ways (Bogen, 1977). In about 98 percent of the right-handers and two-thirds of the left-handers, the left cortical hemisphere facilitates propositional, analytic-sequential, time-oriented serial organization adapted well to learning and remembering verbal information. In these people, the right hemisphere specializes in appositional, synthetic-gestalt organization most adapted to processing information in such a way that elements of thought gain meaning through their association with other elements of thought. The recent research on hemispheric processes of the brain helps to explain some of the results found in psychological research on verbal processes and imagery in learning, encoding and memory. The brain-research findings suggest that although both verbal and spatial modes of information processing exist, it is the type of organization which is imposed upon information that represents its constructed and remembered meaning (Wittrock, 1978); an image or other reproduction of the original presentation stimulus is normally not what is remembered.

In relation to the three types of thinking mentioned earlier by Willems and Brown, Type I thinking seems to be controlled by the inner brain, which is mainly responsible for subconscious and instinctual responses. Type II thinking seems to use only one hemisphere (usually the left) side of the brain, with the right side of the brain performing the passive function of support. For Type III thinking, it is likely that both brain hemispheres are communicating actively. The recent research on encoding and hemispheric processes suggests that the brain constructs meaning by building analytic and holistic organizations upon information in such a way that curricular design, sequences of instruction, and different organizational strategies need to be individually prescribed. Furthermore, instruction with the purpose of creating gestalt-synthetic processes will differ from a picture-illustrated linear sequence of information. An inductive or nonlinear presentation of information is most likely to induce a synthetic processing strategy (Wittrock, 1978). Within the above discussion, learning-concepts gain new meanings. Reinforcement which is well-designed for one hemisphere's strategy may be poorly timed, random, or even worse for the cognitive strategy of the other hemisphere. The brain's organized multivariate reality constructions are probably more sophisticated than they are considered to be in the design of recent instructional materials. The usual roles of teachers and learners will be changed as new models of learning emerge from brain research.

The brain is not passively consuming information received from teachers. It actively constructs and interprets its own information and selectively creates meanings. The implication for instructional development is that in the future, instruction should begin with observation of the learner, knowledge of constructive processes, and individual differences. Wittrock believes that teachers need to recognize individual differences and facilitate the constructive processes of the learner.

Mertiz and Olander (1980) explore the precision management of instructional technology as an instructional model. They believe that through course management and careful measurement of student performance, and also through the informed use of media and microprocessors in instruction, more effective courses can be developed. The Center for Individualized Instruction, a branch of the Advanced Institutional Developmental Program, is developing effective courses at Jacksonville State University in Alabama. This center uses four techniques to achieve its goal: microprocessors, media management, and measurement. Management and measurement deal with the behavior of people, in that one defines roles and expectations and the other provides precise measurement of critical behaviors. The Center employs the Personalized System of Instruction (PSI) (Keller, 1968) for basic organizational structure of its courses. Precision Teaching or Precise Behavior Management (White and Haring, 1976) provides a behavioral measurement strategy which sets the student-behavior frequencies required to trigger program changes in the proper sequence and to permit the PSI's feedback loops to be supplied with data. Media and microprocessors are the other two relevant technologies. Individual courses have different mixes of media to support various instructional goals. Video-taped, audio taped, slide-taped, and filmed programs are represented. Microprocessors, as with media, are used at the Center to various degrees. Some courses do not use media or microprocessors at all, while in two, for instance, 15 commercial slide-tape modules are used in addition to lectures, and labs with microprocessors are used to provide complete interactive evaluation. Mertiz and Olander believe that the improvement of the instructional process through the use of instructional-development technology and planning has caused an effective behavior change in students. The effectiveness of learning is measured by the demonstrated change in recorded behavior from the beginning to the end of each unit. Data provided by the students make it possible for the instructor to effectively direct each student's learning. This approach might be viewed in terms of the prior discussion of teaching students to adapt to the future versus teaching them to plan and lead us into the future.

Cain (1979) has implemented the self-directed learning concept in such a way as to necessitate the development of a unique curriculum. Using a broad range of technology such as video, A.V., micrographics and data processing, several disciplines were arranged into broader teaching topics instead of traditional departmental courses. Staff of the University of Texas Health and Science Center undergraduate program at the Dental Branch believed after a number of years of topic-teaching that an individualized, learner-centered approach to the presentation of topics would be more effective. Each student was seen as taking more responsibility for the learning process, as well as faculty time being more productively spent working in small groups and individually. The faculty became planners and designers as well as producers of educational materials. Because the material was to be dispersed, not through the usual lecture approach, but through multi-media, small groups, and individually, an instructional-support group to assist faculty members was formed. The latter group included two instructional designers, as well as production specialists in such areas as television, photography, graphic arts/medical illustration, micrographics, audiovisual and technical services. Three full-time photographers and three medical illustrators were also included. The curriculum was divided into 20 phases which represented what usually comprised four years of dental study. Each unit contained a guide and a statement of content, objectives, instructional resources, a study plan, and evaluation materials. The University of Texas has, through this means, developed a student-oriented system to take advantage of media as a tool for rapid and, if necessary, repetitive dissemination of information to a learner. This program has allowed the student to move ahead of the class at times and devote more time to areas when needed. Faculty members are more free to facilitate the learning process.

Frymier (1980), a professor of education at Ohio State University, suggestes that during the past 20 years teachers, administrators and curriculum developers had been trying to find the "one best way" in which students learned. From the mid-1950s to the mid-1970s innovation and curriculum development had a foothold. Changes in content, methodology, school organization and political policy (competency-based learning, individualized instruction, etc.) were common. Frymier sees the proposals for educational change made during the last 20 years as being primarily group solutions. Conventional ways of teaching reading were replaced by newer approaches with the assumption that those students who did well in the traditional programs would do better in the novel programs, and students who did poorly would do better under the new approaches. But this did not universally prove true. Students can learn inductively, deductively, vicariously, from direct experience, or through any combination of these. Because there is no "one best way" of teaching, use of curriculum materials, organizational arrangement, or use of time, educators may decide to give up the search for the "one best way" in favor of the concept that different learners have different educational needs. If clear goals and their measures of achievement are made obvious to teachers, then teachers functioning as brokers can effectively accomplish these by bringing students and information together. The question of whether teachers can conceptualize and make operational ways of working with different students, curriculum materials, and instructional procedures in order to maximize learning has been answered positively by Frymier. He believes that students are complex human beings and that teachers can learn to think of their students as complete human beings.

Instructional development has had an impact upon the medical fields and upon business and industry. The reason for this impact has already been discussed in terms of certain fields becoming more product-oriented than process-oriented. Patton (1980) discussed the future of educational technology in industry. Educational technology has had a significant influence on field-training in business and industry, especially in the analysis c course development. Course content is defined in terms of need, task, and target population. In the past, course content was determined by what the instructor had himself been taught during his student days. Today, the course content of most technical and skills courses is based upon instructional objectives resulting from task analyses. Teaching strategies are no longer limited to lecture, on-the-job training or vestibule. Today's training specialist develops a program upon request, first conducting an analysis to determine needs and the appropriate methodology for solving the training problem. The most significant impact has come from educational technology in combination with behavior management. To further improve the role of educational developers in business and industry in the future, the following suggestions are made by Patton: (1) shorten course-development time without adversely affecting quality, (2) use subject-matter experts more effectively, (3) apply educational-technology techniques to the field of management development, (4) expand the scope of educational technology to include behavior maintenance, (5) achieve a greater awareness concerning the differences between adult learners located in a business setting and learners in other age-group/settings. In summary, further cooperation between academicians and trainers in the private sector will be necessary if major advances are to be made in the above areas.

Breakthroughs in brain research could one day result in people sniffing a nasal spray to improve their memories. Sigmund Freud predicted that every mental event would some day be understood as a result of chemical reactions in the brain. Today, some scientists are viewing the brain as a giant chemistry set. Panti (1980) reports that memory, concentration, and fear have recently been identified as chemical events. Implications for education include possible chemical treatment for increased creative ability, enhanced memory, and enhanced attention span. Vasopressin, first synthesized in 1968, is a hormone produced at the base of the brain in the pituitary gland. Scientists have found that, for certain people, a few whiffs of this chemical can improve memory, and the results are possibly lasting. Research at the University of Liege in Belgium on a group of males between 50 and 65 demonstrated that after three doses of vasopressin on three consecutive days, significant improvement was registered on memory and learning tests.

The side-effects of vasopressin are mild and include the elevation of the heartbeat rate and higher blood pressure. Researchers feel that the side-effects can be controlled by administering the drug in smaller doses over a longer period of time. At this time the drug is used primarily to treat amnesia victims; however, in the future, some form of vasopressin may help students sharpen their memory.

Panti approaches concentration as he does memory, by suggesting the use of another drug, ACTH/MSH, a natural brain protein which speeds up the brain and focuses its direction. ACTH/MSH is present in two hormones produced in the pituitary gland. Students injected with the compound were more sensitive to differences in geometric figures as well as more able to concentrate on their studies for longer time periods. The most significant discovery in the use of ACTH/MSH appears to be that it is the only significant drug that can be used in treating mental retardation. Retarded patients given injections were better able to comprehend tasks and demonstrated clearer thinking.

Creative drugs are being explored by Arnold Mandell, a psychiatrist at the University of San Diego, with the hope of enhancing creativity through the use of hallucinogenic drugs. A psychiatrist, Claudio Naranjo, experimented on students with a few of Mandell's drugs and found one compound which seemed to produce neither euphoria nor speeding, but rather a feeling of newness and novelty in a normal situation.

Another compound relieves depression but also creates feelings of high motivation. No pill will turn an ordinary person into a genius or generate motivation where there is none present, but if a person's creative instincts are blocked, psychotropic drugs may sometime in the future be of help. Mandell states that he believes that it will take decades for society to introduce into common usage a performance or life-improving drug, but it could actually be available by 1990.

Artificial intelligence or microelectronic intelligence can be incorporated into almost any product large enough to contain it (Roland, 1979). Pocket calculators and digital watches are only the beginning. There are more than 200,000 low-cost personal computers being used in homes, offices, schools, and factories, and that number is growing rapidly. Many integrated circuits can perform tasks programmed by the user and are called microprocessors. Microcomputers are more economical to use for specific tasks because there is no need to link up with a large master computer. The "small wonders" of tomorrow's world will include: instant information provided by a pocket-sized "dator" combining the features of the CB radio, the giant computer, and the telephone system; home banking to enable individuals to deal directly with banks from their homes; self-guided planes and cars; and classrooms in which students may build and program their own personal computer systems as a part of the school curriculum. From these advancements could come the man/machine symbiosis (Jennings, 1979) in which it may be possible one day to link a human mind directly with a computer. Jennings believes that since brain activity and memory in living organisms appear to be functions of minute chemical changes induced by electric flow, man and computer could become directly linked, and this might result in "instant learning." Any individual with a need to study or practice could benefit from the "brain recordings" of another individual who would pass these on through the computer. Linking the human mind to computer-assisted sensors could enable humans to use any wavelength of the electromagnetic spectrum to "see." These sensors might create a sense of union between man and machine. For instance, a pilot might be "one" with his plane, thus reducing the reaction time required to change its/her/his direction of flight.

Michael--who for 17 years was an intellectual exile, unable to share his thoughts with others because of garbled speech resulting from cerebral palsy--began working a year ago on a computer-based learning system called LOGO. LOGO was developed at the Artificial Intelligence Laboratory and the Division for Study and Research at the Massachusetts Institute of Technology, and has enabled Michael to write dozens of his own computer programs. He now teaches a computer class for other handicapped people with the hope that a communications bridge can be formed for those who cannot express themselves any other way. For many handicapped students, hitting a key on the keyboard is much easier than speaking or writing, and the instant feedback provided on the computer screen is more reinforcing than the confused responses they might otherwise receive from teachers. LOGO can record all input information and errors made by students for later analysis. MIT researchers are using LOGO to develop aptitude tests for handicapped children by redesigning tests originally designed for children who are normal. One of the tests, a measure of concrete reasoning abilities, is a computer version of Piaget's seriation task. A battery of tests such as these will help teachers and children to more accurately gauge the abilities of handicapped children (Ray, 1980). LOGO may give children self-confidence and a bridge to the normal world.

Genetic engineering, a frontier in the biological sciences, has explored the possibility of learning how to cure monogenic hereditary diseases and concern has been expressed that biologists might also be able to modify personalities genetically. On technical grounds Davis (1980) does not think the concern is necessary, because of the large number of genes contributing to any behavioral trait, and because most of them will have made their contribution to a person's individuality before birth. Thus the personality would remain as it was, even though the genes forming it might be altered. Davis believes that most knowledge is double-edged, with both good and bad implications and good and bad applications in a given culture. He suggests that this principle applies not only to knowledge providing new technologies bestowing new powers upon us, but also to knowledge concerning the biological roots of human nature. The acceptance of such knowledge often encounters resistance because it might contradict formerly treasured preconceptions and have political consequences. A safeguard might be to realize the limited power of science in this area in that prescribing solutions to moral problems involves value judgments as well as reality estimates. A more accurate perception of reality would be helpful since we have recognized that large-scale technological applications of the physical sciences have costs as well as benefits. In biology the concern comes not from present harm, but from hypothetical future harm. Thus, while genetic engineering isn't likely to drastically change our personalities, we do need to maintain an informed concern about its activities.

SOCIAL TRENDS AND FUTURE DEMANDS FOR INSTRUCTIONAL DEVELOPMENT

Robert Theobald (1980) expressed the view that a changed world now requires both the teaching of new bodies of knowledge and the teaching of this body of knowledge in new ways. He believes all of us to be a part of an organism within which the behavior of any part affects the well-being of other parts. Three social "strands," or sets of related trends, form an overall pattern illustrating the connectedness of all of the things in life. Three social trends relevant to instructional development can be summarized under the following headings: the frontiers of the biological sciences, the frontiers of the behavioral and social sciences, and the frontiers in communication.

Davis (1980) in his discussion of the biological frontier, suggests that a basic property of the brain that is presently accessible to study on the molecular level and the cellular level is learning and memory. The results of studies with simpler organisms have shown that the cellular mechanisms for learning involve two kinds of alteration: in the functioning of existing synapses and in the formation of new synapses. Rapid progress in identifying the detailed nature of these changes is expected; however, the attempt to understand the physical basis for conscious learning is part of the much more difficult problem of consciousness itself. The set of phenomena could simply disappear as researchers try to dissect the causal connections. Davis states that perhaps consciousness will eventually be understood neurobiologically via some yet-to-be discovered concept. He does not see a return to a mind-body dualism but the emergence of a set of rules for intercellular information flow as unique as was the theory of molecular information storage several decades ago.

> "As biology delves more and more into human behavior it may be expected to interact increasingly with other disciplines concerned with understanding man. In this connection it should be emphasized that the reductionism of biology is only a heuristic device, deepening our understanding of any level or organization by relating it to other levels; the purpose is not to replace one level by another. In particular, the triumph of the mechanistic approach at the molecular level in no way reduces our appreciation of the unique intellectual, moral, and esthetic capacities of our species. Rather we can only stand in awe that life, evolving from inorganic matter, could develop these qualities" (Davis, 1980).

Progress in the social sciences is often demonstrated by advances in observational techniques and instruments (Simon, 1980). The theory of human rational choice and the newly-named discipline of cognitive science help to provide explanations for broad areas of human behavior. In the past three generations social science has sought to clarify the concept of rationality with the hope of better understanding human behavior. Simon is not assuming that all behavior is rational, but rather that human behavior is directed toward goals and the satisfaction of wants and needs; therefore, he sees it as directional. Research on rationality has two aspects; one to prescribe courses of action and the other to describe actual human behavior. The focus of the formal treatment of rationality is the theory of the "subjective expected utility" (SEU). SEU theory and its axioms were developed following World War II. The SEU axioms suggest that the person makes the most of "his or her expected utility in the light of subjective estimates of the probabilities of events" (Simon, 1980). The purpose is to preserve factual testing and the operationality of the axioms. If a number of observations are made of a rational person, through SEU theory it is possible to infer from the choices made by that person whether s/he is behaving consistently or not, and if so, to estimate the person's subjective probability distribution and utility function. This theory is important for three reasons. First, a precise definition of rationality is provided. Second, it makes clear the extent to which human rationality as an assumption is factual and can be tested. Third, it creates a conceptual structure for the use of normative methods in the study of real-world rational decision-making.

During the last 25 years, the most important development in the social sciences relates to the information-processing revolution as a way of understanding human thought-processes. The digital computer and related mathematical and engineering developments in information theory and control theory produced a new paradigm for psychologists and linguists. These theories and devices demonstrated a physical system for handling information embodied in symbols which could be used to make decisions or carry out the process of "thinking." Symbols in this sense represent patterns which can be stored, copied, compared, read and written (Simon, 1980). Therefore, a computer was seen to be a symbol system for carrying on thought-like activity. Computers were seen as providing a new metaphoric type of role. The question of whether a computer performs tasks in any way similar to the human processes or whether they are quite different remains to be answered. The effort to understand the relationship between complex information processing and human thought processes has sparked a new discipline -- artificial intelligence. A reformulation of theory in cognitive psychology has taken place and has revealed some basic commonalities between linguistics and experimental psychology.

Artificial intelligence is concerned with learning how computers can be programmed to do "smart" things. At present many artificial intelligence programs use the "brute strength" approach and do not at all imitate human processes for doing the same tasks (Simon, 1980). Computer programs that represent human cognitive processes are theories of how these processes function. To test these theories a great number of experiments are conducted with human subjects. Research presently underway includes comparing human subjects performing a difficult task while thinking out-loud with the computer simulation output. As research has accumulated, explanations of human thinking for a significant range of problem-solving, pattern-finding and concept-attainment is possible. The research program of the information-processing psychologists includes extending the range of human performance studied to include more complex behaviors while linking theories of this complex behavior to already-existing theories and experimental data concerning simple information processes and their structures. Therefore, theories concerning long-term and short-term memory can be tested directly by experiments on some of the component-processes. This research should help promote the convergence between the focus on "simple tasks" and the emphasis on "higher mental processes." It should be possible to fit both into the same structure of information-processing.

The frontier of communication is the third trend to be discussed. Oettinger (1980) suggests that every society is an information society and every organization is an information organization. He has labeled "information" as a basic resource, like energy and raw materials. Questions like "Who has a resource?" "Who wants it?" "How can you get it?" and "What are the terms of trade?" link each resource to a political power. For information resources, traditional answers are no longer adequate because of large-scale integrated circuits and microcomputers. New answers will be necessary to handle such developments as competition between the computer industry and the telecommunications industry, reliance on satellites and other technical means to prevent war, growing occupations based upon providing for information flow, and controlling the domestic and international struggles over freedom versus control of information.

The three trends discussed, if placed within a systems model, can provide insight into the possible future status of a complex network system such as modern education. Construction of the model begins by an examination of the context in which the model is embedded. National leaders in education are recognizing the necessity for the coordination of cooperative networks of learning systems. For example, Cremin (1976) suggests that educational policies relate to a large variety of educational institutions and that education "...be looked at whole, across the entire lifespan, and in all situations and institutions in which it occurs." Networking through a systems approach has recently become of more interest to ID as the inter-connectedness of needs and resources becomes more obvious (Bass, Lumsden, and Dills, 1978). Branson (1978) discusses the systems concept as beginning in the mid-1960s and as represented by the definition of goals or planned outcomes and the purposeful consideration of various means for achieving those goals. The research suggested that we further understand the cognitive thought-processes of the learner as another essential component of ID. Exploring bodies of new knowledge in original, effective ways will allow ID to remain a growing and relevant field. ID has as its focus the individual student and seeks to enhance each person's growth through the most effective means possible. It, therefore, has no need to define "one" right way to accomplish learning but embraces the concept that for each person's inner perceptions a unique learning formula could be effective.

Education is also a means for facilitating participation in social decision-making. Toffler (1974) asserted that it was within the jurisdiction of the educator not to try to chart a definite course for the future but rather to provide a forum through which future alternatives could be explored. He hypothesized that since effective planning is crucial to participatory decision-making, the opinions of people involved with the consequences of the future should be included. Furthermore, he felt that any view dealing only with those outcomes advocated by a few specialists would not be achievable. He focussed on a viable alternative which included goals identified by the citizenry at large as well as those spotlighted by academics and their institutions. Future planners could then focus by choice on the social and ethical aspects of futurism.

Theobald (1980) argues that new patterns of thought designed to enable people to deal more effectively with their future must be taught, and that these must be taught in new ways. This is the fundamental challenge confronting education for all ages and levels. Small modifications to current patterns will not be enough. Overall conceptual patterns themselves are what are causing it to be impossible for us to give children or adults those conceptual skills which are required to deal with the pattern of events in today's world. People are confused as the complexity of events continues to increase. They will, according to Theobald, be unable to analyze their world as long as they use industrial-era models, which define events as predictable, understandable, and one-dimensional. Ambiguity must now become an expected part of our world.

Theobald mentions some further "driving forces" which are not likely to change much as a result of policy decisions over the next 20 years. The tensions between countries which are rich and those which are poor are expected to increase. The population "bulge" will disrupt the overall structure in the next 50 years in the United States. Migration factors including north-to-south and rural-to-urban population shifts will continue. Environmental problems are serious enough to cause real cutbacks in commitments and threaten the eventual health and safety of our nation. Energy and resource availability will cause infrastructure shifts which make the maintenance of present capital difficult. The climate, although usually stable, has some meteorologists concerned. Telecommunications is the next revolutionary force, which will probably then be followed by a revolution in genetic technology.

Education includes life-long learning and is not limited to the schoolroom. Different people benefit from different educational experiences.

There is a need for more effective community control of the educational system. We need to look further at the implications of these factors for education. Two fundamental forces dominating the '80s were described by Theobald. First, there are people who are "prime movers," who are aware of the future and willing to change "images" people have; and, second, the computer/microelectronics revolution which will force changes in the collection, the organization, and the dissemination of information. The use of the first of these fundamental forces, the prime movers, can be accomplished by moving information through invisible networks rather than through formal channels. Ideas can be moved through systems without the use of formal power. Many past dissemination efforts did not work because new channels for moving information were created instead of using those already developed. The other major force of the '80s, the development of an interactive knowledge-base, has two parts. One type of information system must be available if better decisions are to be made for education and society. Another information system deals with providing better access to information banks and existing data. The first type of information system should have data bases which are made more accessible to citizens and educators. The second information system has had very little work accomplished on it to this point. It involves new forms of knowledge-retrieval systems which would allow information to be structured in new ways and would permit access to key people when needed. Instructional development has the responsibility for taking a leadership role in developing the frontiers of education. Instructional development can play an essential role in the development of the knowledge-base and in its transmission, thus helping to make it possible for education to actually facilitate the "survival" of man in a new age.

CONCLUSION

The material cited in this chapter shows a world in the process of change. This change is occuring not only in terms of surface-structure, many of the details of which were revealed in the preceding discussion, but, of greater significance, in terms of foundational structure.

The implications of this foundational change for the practice of instructional development are to be found through an examination, not so much of I.D. itself, but of those areas forming the foundation upon which I.D. rests. Three of these areas were examined. These areas were (1) the technological tools used by developers, (2) the psychological structure of the learner, and (3) the social fabric within which learning occurs.

It was found that significant new tools will become available for the instructional developer which potentially will change not only the efficiency of the teaching process, but its very nature. It can no longer be taken for granted that most learning will occur within the walls of educational institutions, or that it will be directed by professional educators.

New concepts of man are emerging which will profoundly effect the way in which learning, teaching and communication in general will be conceptualized. The instructional developer must be concerned with such problems as the development of world-views, chemical learning, and the emergence of human-computer hybrids. No longer can visual literacy, for example, be studied solely in terms of the effects of color or picture-placement upon learning from text, or of behavioral effects resulting from television viewing. The teaching of visual literacy may involve, in the future, direct brain stimultion, chemical memory enhancement, and the altering of world-views in order to provide a fuller comprehension of art.

Instructional developers must become "prime movers" if they are to play a role in the future. In order to become prime movers, the strongest implication of this chapter must be actualized: the instructional developer must not only be trained to become a prime mover, but must be trained to function ambiguously in an ambiguous world. He must not be trained in specific skills to be followed religiously, but must be trained to change skills, even to change world-views, as this becomes necessary or appropriate. The instructional developer must not only be flexible, adapting efficiently and effectively to change as it becomes manifest, but must be a leader in producing and directing this manifestation of change.

This necessity for flexibility goes far beyond what is currently thought of as innovativeness. It requires that the world-view of the instructional developer be always a step ahead of what is, concentrating upon what could be. It requires an ability to operate within the here-and-now without being restricted in thinking to either the here or the now. The instructional developer, in short, must be a person functioning efficiently in the ambiguous world of today while simultaneously transforming today's ambiguities into the equally ambiguous, but different, ambiguities of tomorrow. To do this successfully, s/he must operate systematically, but s/he must also recreate her/his system as s/he goes. In the terms currently in use in ID, s/he must be system-bound latitudinally, but must be system-independent longitudinally.

The assumption that instructional developers are capable of operating as prime movers implies that programs training such developers exist. Thus, programs for selecting and training instructional developers must become, in fact, programs for training world-changers. Either this will happen, or instructional development will always be in a state of "future shock," if it does not cease to exist altogether.

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IX. SUMMARY

Chapter 48

Instructional Development: The State of the Art

Ronald K. Bass
Charles R. Dills

The state of the art in instructional development is becoming more simple and, at the same time, is becoming more complicated. It is becoming more simple in that the basic concepts of instructional development are more universally accepted than they were a few years ago and the basic skills of instructional development are held by far more professionals than they were those same few years ago. It is becoming more complicated in that much new knowledge and many new theories are coming to bear upon instructional development for those on the cutting edge of the ID movement.

Not many people thought, as few as four years ago, that so many public school media specialists would be expressing interest in, or, in fact, practicing, instructional development. Not many people foresaw the increase of interest within business and industry in the formation of instructional development units. Not many people anticipated the growth of ID professional interest groups in various national organizations and in many state organizations (as an example, The Florida Association for Media in Education (FAME) is in the process of forming an ID division and has had excellent attendance at ID sessions at its annual conferences in 1980, 1981, and 1982, consisting of about 85 percent public school media specialists). Even fewer were far-sighted enough to envision many of the new inputs which professional instructional developers must consider.

What is the state-of-the-art of instructional development? Instructional Development: The State Of The Art (Bass, Lumsden, and Dills, 1978) was intended to be Step One in describing/defining **The State Of The Art,** in a limited way, and much has been written in the field since. Yet each new work in the field, while better defining instructional development, also raises new questions as to what instructional development really is. Two early chapters in this book (Braden; Dills and Bass)[1] raise critical questions concerning "ID's place in space." Is it an art, or a science, or both, or neither? This work, even though it takes a major step in defining who we are, what we do, and why, falls short of completely describing the (compared to 1978) more sophisticated, better-rooted-in-science nature of instructional development. Instructional development is still evolving.

Our 1978 work (Bass, Lumsden, Dills, 1978) was a far more narrow (chapters) look at the art of ID than is this work and really branched away from the then "traditional" look at ID in only three chapters: "Comprehension and the Design of

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[1] Citations without publication dates refer to previous chapters in this book.

Instructional Materials" (Wilson, 1978), "Cognitive Style Mapping: Its Place in Instructional Design" (Bass and Hand, 1978), and "Collective Bargaining: Adversary or Colleague" (Schaffer, 1978). This work, on the other hand, has departed from the "traditional" considerably in order to look at many new areas of thinking/information which is impacting or will impact ID (Hutchinson; Travers; Wilson; Hand; Stahl; Newell; Merrell; Shrock; DuToit; Wolf; Silber; Blalock), while at the same time providing sound information as to the underpinnings of the ID profession and some very practical views of what is happening on the "firing line" of the field today.

With the above disclaimers, the following is what we, drawing upon the works in this book and other writings, see as the state of the ID art.

We see a field in which practitioners are working very hard to describe themselves and to delineate their activities. We see a field which is indeed looking for its place in space, (Braden). We see a field which is carefully analyzing the training which is being provided for aspiring instructional developers (Silber; Duncan; Daughty and Durzo, 1981; Silber, 1981; Bass and Duncan, 1981-82; Miller and Naumer, 1979-80; Bratton, 1981; Markle, 1981; Wallington, 1981), and we realize that there are differences in the training provided by different schools (Dick and Morgan; Gustafson and Schuller). Attempts to legitimize the services provided by instructional developers are also underway on many fronts (AECT, NSPI, ASTD, etc.) and professional certification of IDers is probably not far from reality (Bratton; Duncan).

We see a field which has moved from a predominantly higher education orientation (Durzo, 1978; Bratton, 1978) to a more universal orientation--public school (Turner), business and industry (Wallington; Durzo, 1983; Kroh, 1983; Miles, 1983; Hart, 1983; Becker and Davis, 1983; Patton, 1980; Wallington, 1980), the military (Platt and Andrews; Goldman) and the international scene (Austin and Titus; Kerr). Higher education, however, has not been forgotten in the work with a look at the strange world of ID in higher education (Terrell and Shrock), and explanations of some specific techniques for diffusion of ID techniques in higher education (Lawrason; McBeath) along with some guidance in selection of an orientation for development activities (Abedor and Sachs). General techniques of diffusion are also presented (Durzo and Florini; du Toit; Wolf), which bring some new thoughts to bear upon the diffusion of ID.

We see a field which for the most part is taking a careful look at the evaluation of the products/processes it produces in the traditional sense (Baker; Baker and Alkin), and is even posing other ways of viewing/evaluating its products/processes (Shrock). Unfortunately, we do see many shops which are operating under the guise of I.D. while not really paying attention to the evaluation of their products at all.

We see a field which is diligently trying to find its place in space (Braden) and is searching for a delineation of its basic scientific underpinnings (Davis; Hug and King; Hutchinson; Schwenn, Lietzman, Misanchuk, Foshay, and Heitland), as well as for theories which can form the basis for the design which instructional developers undertake (Travers; Wilson; Hand; Hand, 1982a; Hand, 1982b; Stahl).

We see a field which is constantly evaluating/re-evaluating designs and techniques which are evolving in the field (Lamos; Osterman; Thomas, Stahl, and Swanson; Merrill; Hand; Stolovitch; Newell) and one which is constantly analyzing ID models as the ideal approach or approaches is/are sought (Trimby and Gentry; Gustafson, 1981; Andrews and Grodson, 1980; Kaufman, Stakenas, Wager, and Myer, 1981; Gentry and Trimby).

We see a field which is interested in interacting with ID clients as effectively as possible (Coscarelli and Stonewater; Price; Rutt), interacting with support personnel as effectively as possible (Mullally), and interacting/understanding subgroups within the field (Dickerson).

We see a field which is interested to some degree in dealing with the cost-effectiveness of ID (Diamond; Wilkerson, 1978), but a field which has not devoted as much attention to this concern as would be justified by the austerity of the times or by the accountability demands which are sure to be made of it.

We see a field which lacks a unified underlying literature. There are works upon which a good many of us rely (Braden and Sachs, 1983), but better efforts must be made to chronicle what instructional developers do, and why. This book takes a major step in the needed direction, our 1978 book (Bass, Lumsden and Dills, 1978), helped, JID (The Journal of Instructional Development) helps tremendously, but a broader literature is needed to help establish ID's place in space.

We see a field in which The Division of Instructional Development (DID) of the Association for Educational Communications and Technology (AECT) was once clearly the leading organization, but is rapidly losing influence as other organizations turn their attention to ID (the National Society for Performance and Instruction (NSPI) and the American Society for Training and Development (ASTD) for example). We see less emphasis upon the utilization of IDers in higher education in the broad sense while we are seeing more emphasis on the use of IDers in the health sciences areas of higher education and in business and industry (both as training officers within major corporations and as consultants to business and industry operating out of instructional development companies). We see the military carrying a great number of instructional developers on their payrolls but anticipate that in the very near future this number will be reduced sharply in favor of the contracting of ID services from independent instructional development/design companies.

We see a field which will undoubtedly take a closer look at the individual differences among the trainees for which the instruction is being designed. The vehicle may be Educational Cognitive Style Mapping (Bass and Hand, 1978; Hill, 1981), the vehicle may be 16PF (Krug, 1981; Cattell, Eber, and Tatsuoka, 1970), the vehicle may be the Meyers-Briggs Type Indicator (Meyers, 1962; Meyers, 1970). All have potential, but this potential must be explored and then incorporated into ID practice.

We see a field which wishes to become a profession (Braden; Schwenn, Lietzman, Misanchuk, Foshay, and Heitland; Wallington; Turner; Silber; Duncan; Bratton; Gustafson and Schuller; Dickerson). This means, among other things, a field whose practitioners regulate their own behavior according to agreed-upon ethical standards (Silber; Finn 1953). It also means that those practitioners understand their own professional behavior patterns, since such an understanding must underlie any rational attempt to formulate such an ethical system. We see a field, however, which has devoted little time or thought to the systematic investigation of its own behavior. with the single exception of investigations of consulting behavior (Coscarelli and Stonewater; Price; Rutt).

We see a field which is in need, therefore, of an investigation of many other aspects of its own behavior, and of that of its members. Networks and circles (Kadushin 1976, 1975, 1974, 1968) play a role in many aspects of our practice. We need to know which kind(s) of circles and networks we form, and how our networks are affected by such things as the control of our reward system(s). We need to know more about our own reward system, both laterally and vertically (Crane, 1976). What sort of social community do we form, and how does this community interact with other communities, and with the larger community? What kinds of career patterns do IDers follow, and is there considerable variation in the career patterns, networks, reward systems and communities among the different segments of the ID job market?

We have seen that we are very involved with culture - its production, change and distribution as this concept (culture) is dealt with by anthropologists (du Toit). We have seen, further, that there have been many investigations of this aspect of our professional practices (Wolf, Jr.; Durzo and Florini; Abedor and Sachs, 1978; Lawrason, 1978).

We see a profession which exists for no other reason than to produce symbol systems and concrete embodiments of these systems, and to distribute them. We see a profession which is in need of an understanding of how its members interact in the production of these symbols and their embodiments. This understanding requires both a sociological analysis of how IDers interact as a culture, and an analysis of our symbol systems in terms of symbology, an aspect both of linguistics and of anthropology. It also requires an analysis in terms of the concepts developed within the sociological study of culture production (Peterson, 1976). Such studies would not only provide us with an understanding of ourselves as a culture and as a sociological community, it would also provide part of the basis for formulating an adequate code of behavior/ethics by which to provide ourselves with self-regulation, a necessary condition for becoming a profession (Silber; Finn, 1953). It would also aid in student job placement, program development, and in analyzing client-consultant interactions.

We see a field which rejects much. Although there are notable exceptions, IDers have mostly rejected, or ignored, techniques derived from behavior modification, the experimental analysis of behavior, and programmed instruction. Little has been done with cognitive behavior modification. Little use has been made of microfiche as a teaching medium. Likewise, student-response systems, fully integrated multi-media approaches, and multiple approaches to course content based upon variations in cognitive style have only been sparsely tried. Media selection models, in practice if not in theory, have yet to become much more than ways to select our own favorite media.

On the other hand, we have widely embraced television, computers, video disks, task analysis, and behavioral objectives. We need an understanding of how and why we, as a profession, choose among the available innovations. We are the gatekeepers, to a large degree, for these innovations; we determine which ones the clients, who are gatekeepers on a different level, are allowed to choose among. How do we decide which to embrace and which to reject, culturally (Heirich, 1976)? When we can answer this question, we will have the basis for a truly adequate development of the concept of cost-effectiveness (Wilkinson, 1978). And only then can we move from **only being efficient** to **being both efficient and effective** (Davies). Again, these questions require the use of both the anthropological paradigm of culture (DuToit) and the sociological paradigm of culture production (Peterson, 1976).

We see a field which will become even more sophisticated in knowledge of neurological science and will begin to use in a meaningful way research on the brain (Hand; Black, 1982; Bradshaw and Nettleton, 1981; Diamond, 1980; Duden-Smith, 1980; Ferguson, 1980; Hampden-Turner, 1981; Horn, 1982; Hand, 1982a; Hand, 1982b; Jastrow, 1981; Kinsbourne, 1982; Ross, 1982). We see a field which will be confronted with new concerns for individuals, which will affect the design of instruction. An example of these concerns would be "stress," a current "hot topic" (Dorscher, 1983; Wallis, 1983; Dee-Brunett, Kulhany, and Krieg, 1983). The last of these three references is to the work of a group which has formed a company with extensive training programs for individual stress management.

And, at the same time we see a field which is attempting to better understand the most basic of our tools for distribution of instruction--the textbook (Thomas, Stahl, and Swanson; Johanson, 1982).

Instructional developers are a diverse group. They operate in many settings. They operate with many and varied restraints and constraints. They operate under many different sets of expectations. Their successes are measured in many different ways. They are trained in many different ways.

Yet they seem to communicate when given a chance, seem to understand one another, and even though from varying backgrounds and settings seem to input valuable information to one another.

Instructional development seems to be an art practiced by many in many different ways, yet seems to be based upon some sciences or areas of science upon which all (or most) draw for solutions to their problems or for communication of their problems to others.

Attempts at defining "The State Of The Art" in this chapter, in Chapter 1 of this book (Dills and Bass), or in the predecessor of this book, Instructional Development: The State Of The Art (Bass, Lumsden, and Dills, 1978), fall short. It is awfully difficult to paint a picture of something in motion and our ever- changing field is rapidly evolving.

Futuristic looks (this chapter; Blalock; Boutwell, 1979) at instructional development have a way of being accurate and inaccurate and somewhat accurate all at the same time. Perspective is all important.

Let's live the future responsibly and professionally and experience "the state of the ID art" together.

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Author Index

Abedor, A.J. 34, 299, 323, 326, 347, 394, 395, 397, 574, 579, 594, 595
Ackerman, R. 127
Ackerson, G. 270
Alexander, K. 501
Alexander, L.T. 295, 298, 299, 394, 572
Alkin, M.C. 88, 311, 316, 319, 320, 321, 325, 594
Allan, G.S. 364, 365
Allen, D.W. 235
Allen,W.H. 344
Allerhand, M.E. 394, 396
Allport, G.W. 153
Alpin, J.C. 42
Amberstone, A. 257
Amberstone, W. 257
Ames, R. 87
Ames, W. 270
Anderson, R. 212
Anderson, R.C. 208
Anderson, R.D. 322
Andrews, D. 2, 431, 457, 459, 464, 594
Ansbro, T.M. 459, 467
Aponte, E. 52
Arbes, B.H. 299, 300
Argyris, C. 296, 297, 305
Aristotle 584
Armstrong, R.H.R. 257
Arnn, J. 82, 294
Asminov, I. 172
Atkinson, F.D. 88, 89
Atkinson, R.C. 228, 229, 235, 236, 594
Austin, D.R. 307
Austin, J.H. 431, 432, 433
Ausubel, D.P. 151, 213, 263, 264, 265, 266, 267, 268, 269, 270, 271, 272
Axtell, R.H. 222, 236, 237
Baddeley, A.D. 152
Baker, E.L. 88, 294, 311, 312, 315, 316, 317, 319, 321, 322, 323, 324, 325, 594
Baker, R.E. 41, 46, 47
Baker, R.L. 213
Ball, H.G. 537
Ball, R.A. 19
Banathy, B.H. 18, 325
Bandy, R. 89
Bank, A. 324
Bannister, D. 583
Barker, B.O. 46
Barker, R.G. 336
Barnard, P. 210
Barnes, B. 213
Barnes, B.R. 267, 268, 269
Barnett, H.J. 347, 349, 354, 356, 357
Barron, R.F. 215
Barson, J. 295, 572
Bar-Tal, D. 42
Bartlett, F.C. 126
Bass, R.K. 1, 2, 31, 246, 539, 541, 574, 589, 593, 594, 595, 596
Batyshev, S. 449, 451
Bauer, R.M. 457
Bauman, D.J. 154
Beach, K.M. 325
Beaglehole, E. 349
Beaglehole, P. 349
Beagles, C.A. 457
Beard, M.H. 235, 236
Beauchamp, G.A. 91
Becker, H. 257
Becker, W.E. 594
Beckhard, R. 396
Bell, A.G. 466, 467
Bell, C.H., Jr. 42
Bell, C.R. 398
Belogortsev, I.D. 450
Benedict, L.G. 51, 52
Benedict, R. 349, 351
Bengtsson, J. 421
Bennion, J. 232
Bennis, W.G. 383, 397
Berelson, B. 152, 153, 154, 160
Berliner, 184, 185
Berman, P. 362
Berman, T. 384, 390

Benrnay, E. 571
Bernstein, M. 383
Berquist, W.H. 34, 394, 395, 398
Bertalanffy, L. 19
Bespal'ko, V.P. 450
Bessent, E.W. 235
Bhola, H.S. 363
Biddle, B. 305
Biddle, W. 212
Billington, M. 213
Birdwhistell, R.L. 355
Bisbicos, E. 151
Black, M. 82, 595
Blackburn, J. 398
Blackwell, L.R. 236
Blaiwes, A. 214
Blake, R.R. 41, 125, 296, 297, 299
Blakemore, C. 125
Blalock, C.D. 579, 583, 594, 596
Bleich, D. 13
Blight 185
Bloom, B.S. 23, 45, 149, 150, 151, 155, 185
Bluth, G. 210
Bobrow, R.J. 466, 467
Bogatz, G. 326
Bogen, J.E. 584
Boleev, K. 451
Bolles, R.M. 421
Bonham, G.W. 421
Bontwell, R. 213
Borg, W.R. 325
Boring, E.G. 127
Bosco, J. 89
Boutwell, R.C. 46, 230, 596
Bower, G.H. 126, 129, 132
Boynall, T. 46
Bracht, G.H. 334
Braden, R.S. 7, 29, 32, 33, 246, 593, 594, 595
Bradshaw, J.L. 595
Brameld, T. 349
Brandt, D. 208, 210
Bransford, F. 128, 129
Branson, R.K. 326, 459, 463, 466, 589
Bratton, B. 32, 81, 82, 304, 307, 390, 511, 521, 522, 523, 564, 574, 594, 595
Brein, R.L. 87
Briggs, L.J. 18, 41, 46, 47, 159, 295, 325, 460, 464, 521, 524, 530, 572, 573
Broadbent, D.E. 118, 125, 152
Brokes, A. 296, 297
Bronfenbrenner, U. 47
Brooks, T.P. 52
Brophy, J.E. 307
Brown, B. 213
Brown, D. 398
Brown, J.S. 175, 466, 467
Brown, M.H. 583
Brubaker, J.C. 41, 296, 297
Bruce, J.B. 452
Bruce, T.T. 305, 575
Brunswick, E. 336
Brush, H. 52
Buchemaier, C.C. 458
Buglaev, V.T. 450
Bullock, D.H. 170
Bunderson, C.V. 235
Burke, W.W. 383
Burmeister, L.E. 212
Burnhill, P. 209, 214
Burton, J.K. 42
Burton, R.R. 466, 467
Butterfield, E.C. 1
Caffarella, E.P. 397
Cain, P.J. 585
Callahan, E. 237, 238
Cameron 185
Campbell, D.T. 316, 334, 335
Cannon, B. 574, 575
Canton, P.F. 501
Caplan, G. 41, 296, 297
Capie, W. 527
Caput, D.Z. 572, 574
Carey, J. 41, 46, 88, 460
Carterette, E.C. 125
Cattell, R.B. 595
Centra, J.A. 394, 420
Chadwick, C.B. 81
Chall, J.S. 207
Chase, W.G. 130
Chisholm, M.E. 501
Christal, R.D. 324
Christiansen, O. 236
Clancey, W.J. 467
Clark, C. 222
Clark, D. 299, 300
Clark, D.L. 363
Clawson, E. 213
Clawson, E.V. 267, 268, 269
Clements, M. 149
Cline, M. 574
Cochran, L.W. 572
Cofer, C.N. 153
Coffing, R.T. 52, 53, 55
Coleman, M.E. 236
Collart, M.E. 89
Colton, F.V. 32
Combes, P. 88
Conkright, T.D. 87
Conrad, R. 154, 159
Cook, T.D. 334, 335
Cooper, R. 215
Coppard, L.C. 257
Corey, J.J. 461
Corrigan, R. 471, 572
Coscarelli, W. 8, 110, 275, 284, 286, 304, 307, 390, 594, 595
Costin 185
Coulson, J. 322
Counts, E.L. 505
Cox, R.C. 326
Crane, D. 595
Crawford, A.M. 236
Cremin, L.A. 588
Cronbach, L.J. 45, 47, 172, 243, 324, 337

Crowder, N.A. 322
Crowder, N.H. 171, 174
Crowder, R. 153
Dale, E. 207
Daniel, E.H. 502
Daniels, A. 18
Danilov, B.B. 450
Daughtry, P.L. 42, 43, 83, 304, 594
Davies, D.R. 540
Davies, I.K. 7, 8, 9, 10, 11, 13, 14, 16, 40, 210, 214, 268, 269, 276, 277, 290, 295, 296, 297, 390, 397, 573, 575, 594, 595
Davis, B.D. 587, 588
Davis, H.R. 362
Davis, J. 257
Davis, J.A. 300
Davis, J.L. 88
Davis, R.M. 295, 299, 572
Davis, R.W. 594
Dean, P.M. 236
Dearden, G. 381
Debes, J. 141
DeBono, E. 46
Dede, C.J. 580, 581
Dee-Brunett, R. 595
Deese, J. 159
Degroot, A.D. 130, 132
Delbecq, A.L. 396
Della-Piana, G. 47
Denike, L. 344
Depierro, J. 210
Deterline, B. 471
Dewey, J. 119
Diamond, S.J. 595
Diamond, R.M. 7, 42, 71, 74, 75, 83, 91, 291, 304, 397, 594
Dick, W. 41, 88, 324, 511, 545, 594
Dickerson, L. 511, 570, 574, 594, 595
Dickie, K.E. 46
Dickman, S. 153, 154
Dills, C.R. 1, 574, 589, 593, 596
Dinklage, L. 283
Divesta, F. 212
Donahue, J.P. 467
Dooling, D.J. 214
Dorfman, R. 90
Dormant, D. 261
Dorscher, J. 595
Dougherty, A.J. 457, 463, 466
Doughty, P. 428, 516
Driga, I. 443
Drucker, H. 84
Drucker, P.F. 9, 10, 579
Dubin, R. 185
Duchastel, P. 213
Duffy, L.R. 467
Duffy, T.M. 457
Duke, R. 257
Dunathan, A. 344
Duncan, M.E. 511, 534, 539, 540, 541, 594, 595
Duncan, R. 384, 386, 389
Dunkin, M. 305
Dunn, W.N. 300
Dunnette, M.D. 44
Durden-Smith, J. 595
Durzo, J.J. 42, 83, 304, 347, 380, 382, 387, 394, 515, 516, 574, 594, 595
DuToit, B.M. 347, 348, 594, 595
Dwyer, F.F. 213
Dwyer, M.R. 396
Earle, R. 43, 215, 306
Easley, J.A., Jr. 339
Easterly, J.L. 89
Ebel, E. 185
Ebel, R.L. 457
Eber, H.W. 595
Eccles, J. 141
Eckert, A. 235
Edmonston, L.P. 324
Edwards, K.T. 84, 89
Ekehammer, B. 306, 307
Ellis, B.D. 236
Ellis, H.C. 152, 153
Ellis, P.A. 326
Ely, D.P. 295, 343, 501, 572
Engel, D. 295, 298, 299
English, F.W. 43, 465
Eraut, M. 13, 387
Erickson, J.R. 159
Eschenbrenner, A.L., Jr. 89
Estes, T.H. 207, 215
Estes, W.K. 151
Evans, J. 159
Evdokimov, V. 447
Fainsod, M. 452
Farace, R.V. 105
Faris, G. 295, 512, 513, 514
Faust, G.W. 45, 230, 322
Faw, H. 212
Feldhusen, J. 87
Felker, D.B. 83
Feliciano, F. 214
Fensham, P.J. 267
Ferguson, M. 595
Fielder, F.E. 306
Figueroa De Guevara, G. 52
Fillmore, C.J. 208
Finch, C.R. 85
Finley, D.L. 465
Finn, J.D. 326, 512, 564, 595
Fiorino 364
Fisher, M.D. 236
Fishman, A. 209
Fitz-Gibbon, C.T. 47, 380
Flavel, J.H. 152
Fleming, M. 323
Fleron, F.J. 451
Flesch, R.F. 208
Fletcher, K. 222, 223, 230, 236, 237, 238

Florini, B.M. 347, 380, 594, 595
Florino 364
Florio, D. 385
Ford, J. 299
Ford, J.A. 349
Foshay, W.R. 7, 40, 45, 594, 595
Foster, R.J. 433
Fox, K. 214
Fraiberg, S. 125
Francis, J.B. 33
Franken, R.E. 139, 145
Franks, J.J. 128, 129
Frase, L.T. 151, 212
Frazer, J.G. 11
Frederiksen, C.H. 208, 209
Freedle, R.O. 208
Freidan, B. 572
French, W.L. 42
Frisby, J.P. 125
Fry, E.B. 207, 210
Fry, M. 213
Frye, N. 9, 11
Frymier, J. 585
Fullan, M. 397
Funkhouser, G.R. 207
Furnival, J.S. 354

Gaff, J.G. 34, 394, 396
Gage, N.L. 184, 185, 316
Gagne, E.D. 151
Gagne, R.M. 18, 43, 45, 47, 151, 159, 172, 173, 295, 322, 461, 464, 521, 524, 529, 530, 572
Galanter, E. 135
Gallessich, J. 299
Gamst, F.C. 353
Garcia, A.B. 236
Gardner, H. 582
Garner, W.R. 130
Gavriushov, V.V. 449
Gayeski, D. 513
Gazzaniga, M.S. 141, 143
Geffen, G. 141
Geis, G.L. 401
Gentry, C.G. 7, 80, 83, 87, 94, 594
Gerlach, V.S. 295, 343, 572
Giacquinta, J.B. 383
Gibb, J. 275, 276, 280, 281, 285, 287
Gibbons, A.A. 45
Gibson, E. 209, 210
Gibson, E.J. 125
Gibson, J.J. 112, 124
Gilbert, T.F. 2, 316, 323
Glaser, R. 43, 321, 322, 325, 336, 362
Glass, B.G. 334
Glass, G. 213
Glass, G.U. 154
Glass, G. V. 269, 270
Globe, S. 361
Glock, M.D. 209
Goldenweiser, A.A. 349
Goldman, H. 2, 431, 470, 594
Goldstein, I.L. 41
Gomberg, W. 425
Goodman, F. 257
Goodman, G. 364, 365
Goodman, W. 213
Goodson, L.A. 459, 464
Goodstein, L.D. 41
Gordon, G.M. 52
Gorman, D.A. 87
Gorshenev, A.N. 449
Graves, R. 21
Grazer, M.H. 505
Green, J.C. 236
Greenbaum, M.L. 19
Greenblat, C. 257
Greeno, J.G. 153
Greenwood, P.W. 384, 385
Gregg, L.W. 153
Gregory, L.S. 47
Gregory, R.L. 125
Greschwind, N. 141
Griffith, F. 452
Grigor'ev, V.A. 450
Grimes, J.E. 208
Grobman, H. 326
Gropper, G.L. 315, 323
Gross, N. 383
Grubb, R.E. 235
Guba, E.G. 47, 307, 334, 335, 336, 337, 363, 465
Guidry, L.J. 207
Guilford, J.P. 522, 524, 525, 526, 527, 528, 529, 531
Gunwaldsen, R.L. 467
Gustafson, D.H. 396
Gustafson, K.L. 511, 554, 573, 574, 575, 594, 595
Gustafson, L.M. 207
Gutwinski, W. 209
Haber, R.N. 145, 152
Hall, G.E. 385
Halliday, M. 209
Halliday, M.A.K. 208
Hampden-Turner, C. 595
Hamreus, D.G. 572, 573
Hand, J.D. 2, 31, 109, 110, 139, 243, 246, 594, 595
Haney, J. 295, 572
Hanselmann, C.F. 460
Hardman, 463
Haring, D.G. 350
Haring, M. 213, 585
Harless, J.H. 88
Harmon, N.P. 524, 529
Harmon, P. 82
Harren, V. 283, 284
Harring, R. 89
Harris, A.J. 210
Hart, F. 594
Hartley, J. 13, 209, 214, 268, 269
Hartshorne, R. 9

Hasan, R. 209
Hatcher, C. 213
Havelock, R. 295, 296, 297, 348, 361, 362, 384, 388, 390
Hedberg, J.G. 422
Heffernan, T.M. 52
Heidt, E.A. 461
Heinich, R. 573
Heirich, M. 595
Heisenberg, H. 13
Heitland, K.M. 7, 40, 594, 595
Hendrix, L. 513
Hennig, M. 571
Herber, H. 212
Herman, J. 317
Hetzel, M.C. 237
Hickey, A.E. 467
Higbee, K. 145
Hill, J.E. 595
Hindmarsh 238
Hinton, W.L. 458
Hittleman, D. 203, 207
Hively, W. 322
Hoagland, C.W. 52
Hoban, C.F. 576
Hoban, C.F., Jr. 576
Hoban, D. 341
Hoban, J. 295, 298, 299, 303
Hobson, N. 257
Hodak, G.W. 459
Hodson, W.G. 52
Holbek, J. 384
Holden, C.P. 146, 147
Holden, E.F.J. 46
Holland, J.G. 2
Hollander, E. P. 305, 306, 307
Holton, G. 11
Holzberlein, K.B. 504
Hood, P. 325, 326
Horn, A. 250, 257
Horn, J.C. 595
Horvath, W.J. 335
Hough, J.F. 452
House, E.R. 390
Hoveland, C.I. 323, 362
Howard, T.E. 89
Hug, W.E. 7, 10, 594
Hulce, J.H., 159
Humphrey, G. 126
Hunt, R.L. 579
Hurlock, R.E. 235, 236
Husek, T.R. 322
Hussian, K.M. 106
Hutchinson, T.E. 7, 51, 52, 53, 69, 364, 594
Hyden, H. 139, 140, 144
Il'Ina, T.A. 452
Inhelder, B. 524
Issing, L.J. 235
Jacobs, F. 425
Jacobson, A 210
Jahn, M. 526, 529
Jardin, A. 571
Jastrow, R. 595
Jeffers, E. 52
Jenkins, J.J. 126, 127, 129
Jennings, L. 587
Jerison, H.J. 584
Jetter, M.A. 501
Johanson, O. 595
Johnson, C.W. 501
Johnson, R. 275, 283, 284, 286, 287
Johnson, S.L. 458
Johnson, T.J. 325, 326
Jonassen, D.H. 84
Jones, H.C. 13
Jones, L. 52
Jones, M.R. 159
Jones, S. 210
Joseph, E.C. 581
Joyce, B. 28
Judd, W.A. 235
Julian, J.W. 305, 306, 307
Jung, C.G. 275, 282, 283
Kadushin, C. 595
Kagan, N. 286, 287
Kaiser, R.G. 447
Kant, I. 17, 114, 115
Kapfer, M.B. 463
Kaplan, R.E. 42, 212, 306
Katona, G. 130, 135, 159
Kaufman, R. 43, 88, 326, 465, 471, 572, 594
Kearl, B. 214
Keeble, D.E. 13
Keele, S.W. 128, 129
Keen, P. 283, 284
Keenan, J.M. 208
Keller, F.S. 585
Keller, S. 185
Kelly, E.F. 73, 75
Kelly, G.A. 582, 583
Kemp, J.E. 295, 341, 344, 411
Kennedy, J.M. 125
Kerr, S.T. 431, 441, 452, 501, 502, 594
Khaliullina, R.N. 447
Kimura, D. 139, 140, 141, 147
King, D.R. 524, 529
King, I.L. 326
King, J.M. 7, 18, 594
Kinsbourne, M. 595
Kintsch, W. 208, 209
Kirk, R.E. 302
Klahr, D. 46
Klare, G.R. 205, 207
Klaus, D. 471
Klausmeier, H.J. 213
Klein, H. 296
Klein, J. 428
Klietsch, R.G. 257
Kluckhohn, C. 349
Knight, D.F. 207
Knight, W. 11
Knirk, F.G. 83
Koberg, D. 46
Kocel, K.M. 141
Kolers, P. 159

Komiski, P.D. 319, 320
Koontz, E. 421
Korol'kova, I.A. 449
Koronatova, G.A. 447
Kosmodem'ianskaia, A.I. 452
Kozma, R.B. 418
Kozminsky, E. 208, 214
Kraditor, A. 570, 572
Krashen, S.D. 141
Krasiuk, N.P. 447
Krasnov, N.F. 447, 448, 449
Krathwohl, D.R. 45, 150, 155
Krech, D. 140, 153
Krieg, S.E. 595
Kroeber, A.L. 349
Kroh, L. 594
Kropp, R.P. 149
Krug, S.E. 595
Kuhn, D.J. 267
Kuhn, T.S. 1, 2, 3, 13
Kulhavy, R.W. 171, 595
Kulikov, A.V. 450
Kunetka, J.W. 324
Kurfman, D. 326
Kurpius, D.J. 41, 277, 296, 297
Kuznetsova, M.L. 449
Lachman, J.L. 1
Lachman, R. 1, 214
Lacock, D.W. 501
Lagerev, V.V. 450
Lahey, G.F. 235, 236
Lamos, J.P. 110, 169, 594
Lange, P. 295, 572
Larsen, J.A. 501, 502
Lavi, A. 85
Lawrason, R.E. 347, 420, 421, 574, 594, 595
Lawton, J.T. 268, 269
Lazanov, G. 141, 145
Lederman, L.C. 19
LeDoux, J.E. 141, 143
Lee, W.S. 88
Leeper, D.P. 501, 502
Legomarsino, L. 213
Leitzman, D.F. 7, 40, 42, 43, 306, 307, 594, 595
Leonard, M.M. 276
Lescop, J.V. 46
Lesgold, A. 209
Lessinger, L.M. 465
Letsinger, R. 467
Levie, W.H. 46
Levin, H. 209, 210
Levine, M. 47
Lewin, K. 383
Lewis, J. 213
Lieberman, I. 504
Lieberstein, S. 451
Liebler, H. 422
Light, J.A. 326
Lincoln, Y.S. 47, 465
Linden, K. 87
Lindquist, J. 387, 394, 396
Lindsay, P.H. 153
Lindvall, C.M. 326
Lingwood, D. 362
Lippert, H.T. 84
Lippitt, G. 42, 306
Lippitt, R. 42, 306, 383, 384, 390
Locaitis, C. 325
Lockhead 572
Loertscher, D.V. 501, 506
Loftus, E.F. 154
Loftus, G.R. 154
Lorton, P.V. 235, 236
Loucks, S.F. 385
Love, B. 257
Lowe, A.J. 87
Lowe, W.C. 467
Lowther, M.A. 82, 90
Luft, J. 277
Luiten, J. 270
Lumsdaine, A.A. 315, 323
Lumsden, D.B. 574, 596
Luria, A.R. 582, 584, 589, 593
Mabry, T.E. 207
Maccoby, N. 207
Macdonald-Ross, M. 207, 209, 214
Mackenzie, N. 13
MacLean, P.D. 146, 147
Madaus, S.M. 502
Magarell, J. 420
Mager, R.F. 42, 149, 160, 161, 165, 321, 325, 471
Mann, D. 385
Marantz, L.S. 35
Margulies, N. 397
Markle, S.M. 45, 46, 47, 315, 316, 321, 323, 327, 471, 521, 522, 573, 594
Marks, L.W. 125
Marshall, N. 209, 210
Martin, N.M. 501, 502
Masia, B.B. 45
Maslow, A. 408
Massey, R.M. 91
Mauch, J. 82
Maurina, I. 445
Mayer, H. 594
Mayer, P. 351
Mayer, R.E. 213, 270, 271, 272
Mayer R.F. 222, 229, 235
Mayer, S. 471
McBeath, R.J. 347, 404, 405, 406, 594
McCann, J. 22, 229
McCann, P.H. 235
McCombs, B.L. 89
McConkie, G.W. 208
McCoon, G. 208
McCormick, E.J. 45
McCullough, C. 212
McDonald, F.J. 235
McGlone, J. 141
McHale 580
McKeachie, W.J. 185, 417
McKinney, J. 283, 284
McLachlan, J.C. 237
McLagan, D. 568

McLaughlin, G.H. 207
McLaughlin, M.W. 384, 385
Mead, M. 351
Medawar, P.B. 584
Mehler, J. 127
Mehta, M.M. 52
Meleragno, R. 322
Meritz, C.T. 585
Merrifield, R.R. 525, 526
Merrill, M.D. 2, 45, 46, 85, 110, 221, 222, 223, 230, 236, 237, 238, 269, 573, 594
Merrill, P.F. 42
Merry, U. 394, 396
Messick, S. 44
Meyer, B.J.F. 208, 210, 212, 213, 214
Meyers, C. 306
Micheli, G.S. 466
Middleton, M.G. 459
Miles, G.D. 594
Miles, M.B. 42
Miles, M.D. 397
Milis, D. 215
Miller, E. 32, 594
Miller, G.A. 133, 152, 210
Miller, G.G. 467
Miller, G.R. 326
Miller, J.G. 22
Miller, R.B. 467
Miller, W. 213
Miller, W.G. 149
Millman, J. 322
Milstein, M.M. 43
Milsum, J.H. 23, 25
Minter, J.W. 420
Misanchuk, E.R. 7, 40, 594, 595
Mitchell, N.L. 502
Mitchell, V.P. 52
Moe, A. 209
Moldakasov, R. 451
Monge, P.R. 105
Montemerlo, M.D. 458, 459, 461
Montgomery, R.E. 323
Moore, L. 574
Moorman, G. 212
Morgan, R. 572
Morgan, R.M. 511, 545, 581, 582, 583, 594
Morris, C.L. 466
Morris, L.L. 47, 380
Morrison, J. 323
Mouton, J.S. 41, 296, 297, 299
Mullally, L.J. 311, 341, 594
Mullins, N.C. 12
Murhry, M. 210
Murray, S.L. 82
Myers, C. 43
Myers, I.B. 595
Nadler, L. 398
Nalbone, P.J. 427
Naumer, J. 32, 506, 594
Neal, G.L. 465, 467
Neisser, U. 125, 126, 153, 155
Nelson, J. 207
Nettleton, N.C. 595
Newell, J. 110, 262, 270, 594
Newkirk, R.L. 236
Newman, M.A. 324
Newmark, G. 322
Niedermeyer, F.C. 326
Niehoff, A.H. 354
Nikandrova, N.D. 447
Niles, O. 212
Nimis, F. 32, 33
Nimnicht, G.P. 326
Noll, V.H. 457
Norman, D.A. 129, 151, 153, 208, 225
Norris, W.C. 581
Norton, R.F. 238
Novak, J.D. 267
Nugent, W.A. 457
Nyre, G.F. 35
O Dal'Neishem 449
Oettinger, A.G. 589
Ofiesh, G. 471
O'Hara, T. 149
O'Keefe, J. 143, 144, 147
Olander, C.P. 585
Olejnik, S. 270
O Merakh, P. 443
O'Neil, F.A. 235, 236
O'Neil, H.F., Jr. 89
O'Neill, H.F. 457, 463, 466
Opler, M.E. 350
Orlansky, J. 466, 467
Orlich, D.C. 88
Orlosky, D. 581
Osterman, D. 110, 177, 428, 594
Owen, S.P. 89
Owen, T.R. 244
Owens, T.R. 47
Page, S.H. 322
Paivio, A. 270, 584
Panti, C. 586
Paradise, N.E. 322
Parlett, M. 381
Parsons, T. 352
Pask, G. 174, 175
Patridge, M.I. 32, 513, 515, 574
Patterson, H.L. 322
Patton, F.D. 586, 594
Pearson, D. 207
Pearson, R.H. 501
Peek, J. 213
Pereboom, A.C. 334
Perfetti, C. 209
Perfilou, N.G. 450
Perlman, J. 460
Peterson, L.B. 152
Peterson, M.J. 152
Peterson, R. 595
Pfister, F.C. 501
Phillips, D. 425
Phillips, D.C. 11
Phillips, S.R. 34, 394, 396
Pia, J.J. 22
Piaget, J. 115, 119, 120, 129, 265, 524, 527, 528, 530, 582

Pilecki, F.J. 22
Pilon, D.H. 398
Pincus, J. 384
Piskunoua, N. 452
Pittenger, J.B. 127
Pitts, J.M. 506
Platt, W. 2, 431, 457, 594
Poole, R. 13, 149
Poorman, M. 574, 575
Popham, W.J. 44
Porras, J.I. 42
Posner, M.I. 128, 129, 130, 153
Postlethwait, S.N. 184
Postman, L. 152, 153, 159
Powell, C. 398
Powers, R. 214
Pray, S.L. 185
Pressey, S.L. 169, 170, 171
Pressman, L.P. 446, 452
Pribram, K.H. 133, 140, 143, 144
Price, R.D. 110, 289, 290, 295, 296, 298, 299, 303, 575, 594, 595
Prigge, W.C. 539
Proger, B. 215
Prostano, E.T. 504
Prostano, J.S. 504
Provus, M. 325
Quellmalz, E. 324
Rachemko, I.P. 451
Radcliffe-Brown, A.R. 349
Rahmlow, H.F. 325
Rankin, W.C. 459
Rapoport, A. 335
Rasco, R. 213
Rau, L. 159
Rau, V.G. 447
Ray, K. 587
Raynor, G.T. 326
Reed, S.K. 128
Reid, F. 214
Reigeluth, C.M. 45, 85, 230, 236
Renner, 522
Resnick, H.S. 84
Reynolds, L.J. 326
Rhodes, W. 277
Richards, B.F. 236, 237, 238
Richards, R.E. 230
Richardson, P. 244
Rickards, J. 212, 213
Rickards, J.P. 264, 273
Ring, D.G. 267
Rippey, R.M. 47
Robeck, M.D. 322
Robinson, F. 214
Robinson, M. 173, 174
Robinson, M.L. 89
Robinson, T.J. 324
Roever, M. 471
Rogers, C. 275, 276, 279, 280, 285, 287
Rogers, D. 236
Rogers, E. 286, 348, 362, 381, 382, 383, 387, 388, 389, 397, 579
Rogers, R.A. 383, 387
Roland, J. 587
Romiszowski, A.J. 84
Rose, C. 33, 35
Rosen, D. 52
Rosen, M.J. 315, 323
Rosenshine, B. 209
Rosenval, J. 236
Ross, E.D. 595
Rossett, A. 32, 33
Rossman, J. 524
Rothkopf, E. 209, 212, 213
Rothkopf, E.Z. 151
Rowe, M.B. 19
Rowland, G.L. 139, 145
Rubenstein, M.F. 90
Rumechart, D.E. 208
Rummler, G.A. 323
Russell, H.M. 105
Rutt, D.P., Jr., 42, 110, 294, 304, 307, 594, 595
Sachs, J. 127, 154, 159
Sachs, S.G. 34, 347, 394, 395, 397, 574, 579, 594, 595
Saettler, P. 81, 535, 537
Sagan, C. 146
Salomon, G. 46, 153
Saltinski, R. 82, 90
Sameroff, A.J. 306
Samokhvalova, T.J. 448
Sampson 522
Samuels, M.T. 159
Sarason, S.B. 386, 390
Sargent, A.G. 394
Sashkin, M. 361
Savage, A.L., Jr. 286
Scanland, W. 460, 462
Scandura, J.M. 45, 46
Schaffer, D.R. 594
Schatz, A. 244
Schein, E.H. 41, 276, 278, 280, 296, 297, 390
Schild, E.O. 257
Schmidt, R.F. 125
Schmidt, R.V. 230, 237
Schmuck, R.A. 42
Schneider, E.W. 222, 223, 230
Schuller, C.F. 511, 554, 594, 595
Schultz, A.A. 451
Schulz, R.E. 322
Schulzetenberge, A.C. 502
Schutz, H. 214
Schutz, R.E. 41, 47, 318, 320, 325, 327
Scriven, M. 47, 88, 318, 320, 324
Schwenn, T.M. 7, 40, 43, 87, 573, 594, 595
Searle, B.W. 235, 236
Seddon, G.M. 149
Sedlik, J.M. 326

Segal, E.M. 155, 159
Seidel, R.J. 235
Semin, V.A. 49
Shamrai, V.B. 447
Shannon, C.E. 96
Shapovalendo, S.G. 445
Shaw, M.E. 305
Sheby, W.J. 208
Sheffield, F.D. 323
Sherman, T.M. 81
Shettel, H.H. 83
Shevrin, H. 153, 154
Shoemaker, D.M. 322, 381, 382, 383, 388, 389, 397, 579
Shoemaker, F. 286, 362
Shoemaker, J. 504
Shrock, S. 47, 307, 311, 333, 347, 414, 594
Shurtakova, T.V. 450
Shustrov, V.A. 450
Sikorski, L. 386
Silber, K.H. 290, 295, 511, 512, 513, 520, 523, 524, 525, 526, 527, 528, 529, 530, 531, 573, 574, 575, 594, 595
Silberman, H. 322
Silverman, S.F. 353
Silvern, L.C. 84, 85, 471
Simon, H.A. 130, 132, 588
Sirotnik, K. 322
Sisakhti, G.R. 42
Skilling, H.G. 452
Skinner, B.F. 14, 111, 169, 170, 171, 582
Slobin, D.I. 127
Slough, D.A. 236
Smith, B.L. 362
Smith, B.O. 581
Smith, D. 43
Smith, F. 325
Smith, H. 447
Smith, N.J. 82
Smith, P. 323
Smith, R. 401
Smith, R.B. 149
Sneed, L.C. 305, 575
Snelbecker, G.E. 91
Snow, R.E. 45, 172, 173, 337
Snowman, J. 31, 149
Spiller, R.T. 236
Spindler, G.D. 352
Spitzer, D. 260, 396, 419
Splaine, J.E. 88
Spuck, D.W. 89
Stacy, E.W., Jr. 155, 159
Stager, R.A. 177, 180
Stahl, R.J. 109, 110, 149, 150, 151, 155, 160, 161, 164, 203, 208, 594, 595
Stake, R.E. 88, 320, 324
Stakenas, R.G. 594
Staley, J.D. 467
Stamas, S.T. 83, 91, 573
Stanley, J.C. 316, 335
Starr, M.D. 12
Steele, F. 276, 294
Steiner, G.A. 152, 153, 154, 160
Steinwachs, B. 257
Stenber, N. 257
Stephens, K.G. 46
Steward, J.H. 350
Stewart, E.C. 433
Stoker, H.W. 149
Stolovitch, H.D. 91, 110, 250, 251, 253, 257, 260, 594
Stolurow, L.M. 269
Stone, J. 87
Stone, S.K. 504
Stonewater, J.K. 89, 110, 275, 284, 286, 304, 307, 390, 594, 595
Stowe, R.A. 325
Strang, R.C. 212
Strasel, H.C. 465
Strauss, A.L. 336
Strickland, B. 82, 294
Strickland, S. 236, 237
String, J. 466, 467
Strother, S. 336
Strunk, W., Jr. 205
Stufflebeam, D.L. 35, 88, 325, 381
Sugarman, R.C. 458
Sullivan, H.J. 322, 325
Sullivan, J.S. 506
Sulzen, R.H. 323
Swanson, C.C. 110, 203, 208, 594, 595
Swierczek, F.W. 300
Swope, W.M. 466
Tatsuoka, M.M. 595
Taveggia, T.C. 185
Taylor, G. 397
Tennyson, R. 213
Tennyson, R.D. 32, 88, 345, 513, 515, 574
Terrell, W.R. 33, 246, 347, 414, 424, 594
Thayer, W.R. 364, 365
Theobald, R. 587, 589, 590
Thiagarajan, S. 85, 250, 251, 253, 257, 260, 261
Thomann, D.P. 52, 53
Thomas, D.B. 235
Thomas, K.J. 110, 203, 210, 212, 214, 594, 595
Thorndike, E.L. 132
Thorndike, P.W. 208
Thorne, H.E 323
Thurman, G. 506
Tiemann, P.W. 45, 513
Tiffin, J. 88
Tilles, S. 276, 296, 297
Tinovskii, I.R. 443
Titma, M. 453
Titus, A.A. 431, 432, 433, 594
Tobin, K.G. 527
Toffler, S. 589

Tombaugh, R.F. 257
Tosti, D.T. 85, 89
Totten, H.L. 504
Towle, N.J. 87
Tracey, W.R. 41
Travers, R.M.W. 109, 111, 125, 594
Traxler, A. 212
Trevarthen, C. 584
Trimby, M.J. 7, 80, 88, 94, 594
Tuckman, B.W. 84, 89
Tuinman, J.J. 208
Tulving, E. 153
Turner, P.M. 431, 501, 502, 504, 505, 594, 595
Twelker, P. 81, 83, 257
Tymitz, B. 251, 338
Ulrich, R.E. 185
Vandermeer, A.W. 323
Van De Ven, A.H. 396
Van Dijk, T.A. 208, 209
Vaughn, J.L., Jr. 207
Veselov, N.G. 443
Vipond, D. 208, 209
Voloyich, M.B. 445
Voss, B.X. 270
Wager, J.C. 594
Wald, J. 127, 129
Wales, C.E. 177, 180
Walker, C.H. 208
Walker, R.A. 236
Waller, T. 212
Wallington, C. 431, 496, 523, 524, 527, 529, 530, 574, 594, 595
Wallis, C. 595
Walter, S. 43, 306
Wanska, S.K. 268, 269
Warner, M.S. 236
Wason, P.C. 159, 210
Watson, J. 383, 384, 386
Watson, P.G. 396
Weaver, R.L. 278, 279
Weaver, W. 96
Webb, L.L. 89
Weber, J. 210
Webster, W. 141
Weil, M. 28
Weiner, N. 96
Weintraub, S. 213
Welsh, J.R. 237
Welsh, W.A. 359, 364, 365, 367
West, L.H.T. 267
Westley, B. 383, 384
White, E.B. 205
White, L.A. 348, 350
White, O.R. 585
Whitman, J.R. 130
Whittrock, M.C. 153, 155, 160
Wilcox, W.C. 236, 237, 238
Wilkinson, G.L. 343, 594, 595
Willems, A.L. 583
Williams, R.G. 45
Willis, K.P. 501
Willson, V.L. 334
Wilson, B.E. 109, 126, 594
Wilson, B.G. 238
Wilson, J.Q. 423
Winter, D.G. 425
Winter, E. 209
Wissler, C. 349
Witt, P.W.F. 299
Wittrock, M.C. 584, 585
Wolf, E.F. 353
Wolf, R. 338
Wolf, W.C., Jr. 347, 359, 364, 365, 367, 594, 595
Wood, J.S. 536
Wood, M.D. 230
Wood, R.K. 46
Woodword, A.K. 526, 529
Wright, P. 210, 214
Wyne, M. 398
Wynn, R. 536
Yeates, D. 18
Yeh, J.P. 317
Yelon, S.L. 295, 298, 299, 394, 572
Yohalem, A.M. 571
Young, K. 350
Zajkowski, M.M. 461
Zaltman, G. 361, 384, 386, 387, 389
Zaznobina, L.S. 446
Zdravstuui, S. 443
Zeiler, M.D. 159
Zel'manova, L.M. 445
Zender, B.F. 450, 451
Zisman, S.B. 576
Zuev, V.J. 450

Subject Index

Abstract-logical stage, Piaget, 265
Academy of Pedagogical Sciences, 443
Accreditation, and certification, 534-535; definition, 534, 565
ACTH/MSH, 586
Action, range of for ID, 8-9
Active Context Development Model, 38
Adaptation of existing models, 90
Addition theory, and AO's, 271
Addresses of international organizations, 434
Adjunctive elements of text, 212-213
Adoption of innovations, steps in, 381-382
Advance organizers, 262-274; attributes, empirical, 270; comparative, 264; definition, 262, 271; development, 271-273; expository, 264; history, 263-266; interspersed, 269-273; Jello, 272; research, 267-271; state of art, 273
Advocates, and innovation, 355; of change, 355
AECT, 496, 499-500, 502, 594; certification through, 564-565
Affiliative Model, consulting, 297
Agency for International Development, 433
Air Force, developmental approach to training, 471-473; history of ID in, 470-473; ID in, 470-495; ID, benefits from, 493; ID, extent of application, 493-495; ID, future prospects, 495; ID, manuals, 492-493; ID, model, 491-492; ID, overview of, 473-475; ID successes in, 493-494; ID, underlying concepts, 473; where applied, 492-495; learning by doing, 471-473; training concepts, 470-473
Air Training Command, 492, 471; ID teams in, 495
Arkansas, at Fayetteville, University of, 246-247; Medical Center, University of, 247-248
ALA, 501, 502
Algorithmization, 451
Allocation of resources, 344-345
Alternative teaching approaches, 177-202
American Library Association, see ALA
Americal Society for Training and Development, see ASTD
Analysis step in Air Force ID model, 475-478
Anasynthesis, 85
Anthropology, 348-358
Applications of ID, 431-510
Archetypes of ID, 11-17; paradigms, models and, 8-17; conceptual nature of, 11-12
Army, TEC, 460
Art, ID as, 596
Artificial intelligence, 587-588
Assimilation - Encoding Theory, and AO's, 271
Association for Educational Communications and Technology, see AECT
ASTD, 499-400, 594, 596
ATI, 172-175, 228; and learner control, 239
Attitudes, student, 417-419
Audio-Visual Archetype in ID, 14
Ausubel and Piaget, 265-266
AV Center, MSU, 554-555
Basis of educational technology, scientific, 124; instructional design in theory, 111-168
Behavior, approaches to the study of, 111-112
Behavior, social trends in the science of, 588
Belief System, Cognitive, 154-155
Beliefs, intercultural, 436
Biological science, social trends in, 588
Black boxes, 20
Bloom-Mager System, alternatives to, 149-166
Book, this, structure of, 5-6
Brain, diagram of, 142; functions of each hemisphere, 141; research on, 139-147; split, 139-147
Branching, in programmed instruction, 174
Brazil project, 556
Budgeting, and military training, 462-463
Business, ID in, 496-500; ID in, future of, 499-500; ID in, state of the art summary, 497-499
CAI, 172-175; adaptive model, 228-229; intelligent, 175; tutorial, 228
Capacity, of interfaces, 97; of nervous systems, 116-117
Career fields in ID, 547-548
Case study, guided decision making, 180-197; international consulting, 437-440
Cat, Teaching to Like Mustard, 448
CBD, 433
CBI, 169-175
Centralization, education in USSR, 442; ID in USSR, 453
Certainty vs. provisionalism, 381
Certification, AECT and, 564-565; assessment of current state, 538-539; ASTD and, 568-569; competencies list, DID, 566-568; conclusions concerning, 543-544; definition, 534, 565; DID and, 565-568; educational technology and, 534-544; feedback and, 540-543; guidelines, current, 539-540; Joint, for Media Personnel, 536-538; NSPI and, 568-569; quality control and, 541-543; relation to accreditation, 565; relation to licensure, 565
Change Agency Programs, 400
Change Agents, 388-389; client contact and, 389-390; ID'er and, 426-427; internal vs. external, 388-389; programs, 400; roles of, 388
Change process, mechanisms, 353-354; resistance to, 386-388
Change, Transformational Model of, 404-406
Channel, 122
China Syndrome, 30-31
CIPP, model, 35-36

Circles, 595
Citizen literacy, definition, 580
Classical perception theory, 112
Classroom, as system, 19; culture of, 352
Client, identification of "true," 42
Client conference, 289-293
Client-consultant relationship, 275-309
Client-Demand Methodology, 52
Client needs, 289-290
Climates supportive of consulting, 281
Closed systems, 20-22
CMI, 173-175
Cognitive Behavior Modification, 595
Cognitive Belief System, 154-155
Cognitive process in Domain of Instruction, 175
Cognitive psychology, 126-137, 149-166, 467; and computer, 172-175; and instruction, 134-136, 175; projected developments in, 582-587
Cognitive structure, 263
Cognitive Style Mapping, 595
Cognitive task analysis, 172-173
Collaborative Model, of consulting, 296-297
Commerce Business Daily, 433
Commitment, to events, and Systematic Style, 285; to new ideas, and Spontaneous Style, 284
Communication, models, 96; open and honest, 277-279; social trends in, 588
Communist Party, role in USSR ID, 443
COMMUNITY Radio, game, 259-260
Comparative organizer, 264
Competencies, for developers, 499-500; Florida State University ID Program, 549-550
Competency programs in international consulting, 436-437
Competition in schools, 25
Complexity in instruction, 173-175
Component formative evaluation, 316
Comprehensive development program, 400
Computer Aided Instruction, see CAI
Computer Based Instruction, see CBI
Computer Managed Instruction, see CMI
Computerized instruction, models of, 88-89
Computers, 588, 590, 595
Computers, and cognitive psychology, 172-175; and instruction 172-175; in USSR, 451
CONCENTRATION, a game, 251-253
CONCEPTS, and conversational programming, 174
Concepts of systems theory, 81
Conceptual nature of ID, 1-5, 8-17
Conclusions concerning, business/industry and ID, 499-500; certification, 543-544; choosing program emphasis, 401-402; conceptual nature of ID, 16-17; formative evaluation; 317-318, 329-330; future of ID, 590; General Systems Theory, 28; higher educational ID, 417-418; ID's relation to universe 38-39; IIA and ID, 73; instruction, 136-137; instruction and cognitive psychology, 136-137; international consulting, 440; liberal arts and ID, 428-429; media staff relationships, 346; military training, 466-468; naturalistic inquiry, 339-340; public schools and ID, 505-508; social issues and interventions, 48; systems models, 91; USSR, ID in, 454; women in ID, 575
Concrete-operational stage, 265
Conditioned reflex, 118
Confirmation of results, 482
Conflict of interests in higher education, 414
Conscious cognition, 223
Conscious processing, levels of, 223
Conservator, 155
Consolidation and storage in SPInPrOM, 154
Consortium, Pre-Medical Academic, 247-248
Cost-effectiveness, 594
Costs determination, 486
Consultant/subject-matter expert relations, 294-307
Consultants, outside, 398
Consulting, conditions necessary for, 279-282; definition of relationship, 294; international, 435-440; leadership styles, 304-307; military, 467; models, 296-298; research on, 300-304, 307; social issues and, 41-42; styles, 294-307; task environment and, 299-300
Content analysis, 477
Content control, 222, 235
Context, development, 35-38; display, 232; evaluation, 35; meaning and, 126-137; motivational, 232
Contextual, formative evaluation, 317; storage, 144
Contingency model of leadership, 306
Contract, consulting, 291, 293
Control of pace, 235
Convergent formative evaluation, 316
Conversational approach to instruction, 174-175
Cooperation in schools, 25
Correctness of response, 231
Countenance model of evaluation, 381
Creation of new systems models, 90-91
Creative drugs, 586-587
Creativity, conditions for, 279-281
Criteria for a profession, 512
Criterion-Referenced Instruction in business, 498
Criterion test items, 481
Critical mass, 498
Critique of ID training approaches, 517-523, 527-528, 531
Culture, 595; change, planned, 348; clashes, 357; classroom as, 352; definitions, 348-351
Cues, contextual, 210-215; inter-textual, 214-215; intra-textual, 210-212
Curriculum Committee, working with, 426
Curriculum development in ID at Michigan State University, 559
Cybernetic Model, 35; with CIPP Model, 35-36
Danger signals in initial consulting conference, 291-292
Data analysis, external, 285; internal, 285; styles of, 285
Data gathering, studies, 321; style of, 284
Data transporter, 152
Decision-Making Methodology, 52; models, 282-287; styles, 284-285; styles, training in identification of, 286-287
Decision-logic, table, 478
Declining enrollment in higher education, 417
Deductive training, by cultures, 436
Defensive communication, in consulting, 280

Delivery of knowledge in future, 562
Dependency, of interface, 97
Dependent decision-making model, 283
Deprivation, of interface, 97
Description, in consulting, 280-281; of metamethodology, 53
Design, of text materials, 210-215; of meaningful learning, 134-137
Designs, instructional, 169-274
DET, see Domain of Educational Technology, 29
Determining costs and resource requirements, 486
Developer Development, 32-33
Developing instructional materials, 486, 488
Development, anthropology and, 348-358; management of, 41-43; models of, 360-361; processes for systems models, 90-91; student, 243-249
Development and formative evaluation, 317
Development of instructional products, 325-326
Developmental approach to training, Air Force, 471-473
DID, see Division of Instructional Development, 594
Diffusion, definition, 347, 351; empirical findings about, 361; ID and, 347-429; individuals and change, 381-382; models of, criticism of, 361, 505; of innovations, history of, 381-383; purchasing of, 401; research variables, weighting of, 363; significance for ID, 347; theory, history of, 360; variables in models of, 363-364
Directionality, of interface, 97
Display, context, 231; control, 223; control, research on, 236-237; instructional value of, 231; presentation of, 230-231; sequence, research on, 236-237; types, 230-231
Distance education, military, 460
DIT, see Domain of Instructional Technology
Division of Instructional Development, 594; certification and, 565-568; competency list for certification by, 566-568
Domain of Cognition, 155-159; chart of, 156; introduction to, 155-156; levels of, 156-159; list of uniprocesses, 158; specific cognitive processes in, 157; summary of, 164-165
Domain of Educational Technology, 29
Domain of Instructional Technology, 29; model of, 83
Dominance, hemispheric, 140-143
Driver, 230
Driving forces, 589
Early adopters, 382
Early majority, 382
Economic situation in higher education, 420
EDP, see Educational Development Project, 556-557
Education, anthropology and, 348-358; conclusions concerning systems in, 28; definition, 351; General Systems Theory in, 18-28; intercultural knowledge and, 436; planned culture change as, 351-352; USSR in, 441-454
Educational Cognitive Style, 595
Educational Development Project, 556-557
Educational technology 29-30, 457-495; certification of professionals, 534-544; conclusions concerning certification 543-544; conclusions concerning military, 467-468; definition, 82; future of, 579-590; history of training in, 535-536; in military, 457-495; in USSR, 441-454; need for scientific basis of, 124
Effect-size statistic, in AO research, 269-270
Effectiveness, ID as, 9-11
Effectors, sensory, 155
Efficiency, ID as, 9-11
Effort, level of, 298
Empathy, in consulting, 281
Enculturation, definition, 351
Engineering archetype, as ID, 14
Engineering, human, definition, 471
Enrollment, declining in higher education, 417
Environmental information, processing of, 150
EOC, 231-232
Equifinality, General Systems Theory and, 27-28
Ethics, ID and, 416-417; paradigms and, 13
Evaluation, 312-332; as a political act, 312; field, 490-491; functions of, 314-317; ID and, 311-340; in military ID, 465; internal, 490; methodology, 52; models 88, 324-325; of faculty readiness, 404-413; of ID projects, 380-392; of instructional systems, 490; of materials, 412-413; of objectives in military, 463-464; of performance, 345; of planned change projects, 391-392; problems with, 312-313; questions for studying change, 382-383, 385-388, 390-391; social issues in ID and, 46-47
Evaluation vs. description, in consulting, 280-281
Evaluator, definition, 318
Executor, 152-153
Expectations in consulting, 290
Experimental analysis of behavior, 595
Expository organizers, 264
Extension courses, military, 460
External learner control, 223-225
External style, of data analysis, 285; of information processing, 284
Factors, evaluation of change projects, 391-392
Faculty, definition, 395; incentives in higher education, 415; perception of roles by 415; vs. students, in higher education, 416
Faculty Development, 404-413; as program emphasis, 400-401; definition, 33; evaluation of, program at SJSU, 411; future of, at SJSU, 411; guidelines for, 404-405; ID and, 404; ID'ers working with, 426; IIA and, 394-402; modules for, 410-411; programs in liberal arts, 426; relation to instruction, 33; relation to SD 33, 245-246
Faculty Development Materials Questionnaire, displayed, 412-413
Faculty Self-Appraisal, Concept, 408-409; Form, see FSAF; program, SJSU, 408; program, and ID, OD, 394-402
FAME, 593
FD, see Faculty Development
Feedback, certification and training and, 541-543; in SPInPrOM, 155
Feedback lecture, 177-202; design of, 180-197; evaluation of, 187-196; example of, 198-201; study guide for, 197-201

Feedforward, 155
Fidelity, physical and functional, 461; psychological, 461
Field evaluation, 490-491
Field experiences, guided, 540-541
Filtering, as information reduction device, 117-119
Filters, in consulting, 282; Johari Window, 282
Florida Association for Media in Education, 593
Florida State University, competency areas in ID training, 549-550; evaluation of training program, 546-548; history of ID training at, 545-556; training in ID, 545-553; Procedures and features of program, 550-553
Formal analysis and social issues, 43-46
Formal features of text, 213
Formal leaders, 382
Formal vs. informal education, 351
Formative evaluation, 312-332; conclusions concerning, 371-318, 326, 329-330; definition, 318; development and, 317; difficulties researching, 320-321; functions of, 314-317; ID and, 319-330; levels of functioning in, 313-314; need for, 319-320; problems with, 320; procedures for, 326-329; product development and, 320; product evaluation and, 324; research on, 320-324; staff procedures in, 329
Frame games, definition, 250; discussed, 250-251; example of, 251-253; game chains, and 257-261; List of, 257
Freedom, psychological, in consulting, 279-280
FSAF, and program development, 408-410; at San Jose State University, 409-410; validation of, 410
FSU, see Florida State University
Functional fidelity, 461
Functioning, levels of, in formative evaluation, 313-314; of interfaces, 104-105
Functions of evaluation, 314-317
Funding opportunities, ID and, 427-428
Future demands for ID, and social trends, 587-590
Future directions of research on consulting, 304-307
Future Forecasting Game, 260-261
Future, knowledge delivery in the, 562
Future of ID, 596; business/industry, 499-500; conclusions concerning, 590; military, 466-467, 495; training programs in, 531-532
Game chains, 257-261; examples, 259-261; frame games and, 257-261
GAMEgames, 253-256
Games, 250-261
Gaming, models of, 88
Gatekeepers, 382
General Systems Theory, 18-28; conclusions on education and, 28; cooperation vs. competition in shcools and, 25; equifinality and, 27-28; ID and, 18-19; implications of, 18-19; optimization and, 25; overview of education and, 18-19; stabilty and, 26-27; systems analysis and, 18-19
Generalized Systems Model, 30
Generic skills, 523
Goal analysis, in Air Force, 476-477
Goal orientation, spontaneous style and, 284; systematic style and, 285
Goals, establishment of, 342
Graduation, definition, 534
Graphics in text, 213-214
Guided decision making, 177-202, 400-401; as teaching strategy and ID, 180-197; case study, 180-197; steps in, 179
Guided field experiences in certification, 540-541; in training, 540-541
Guidelines, choosing program emphasis, 400-401; certification, existing, 539-540; FD programs, 404-405; PEPA Questionnaire, administration of, 73-74
Help, in learner control research, 237
Hemispheric dominance, 140-143
Hierarchies, in human development, 24-25; in subject matter, 24; in systems, 22-28
Higher education, changes in students, 420-421; conclusions concerning ID in, 428-429; conflicts of interest in, 415-416; declining enrollments, 417; economic situation of. 420; faculty incentives, 415; FD programs and, 426; funding opportunities, 427-428; ID in, 71-79, 414-429; ID in, compared to business, 496-497; IIA in, 414-419; new technologies and, 420-421; orientation of ID in, 415; potential for ID in, 422-424; problems of ID in, 414-419; strategies for, 72-73, 417-419, 424-428; survival of ID in, 71-72; USSR, 453; working with change-agents in, 426-427
Higher-level skills approaches, critique, 522-523; using, 522; in ID training, 521-523
History, educational technology and ID training, 535-536; FSU ID training program 545-546, 548-549; military training and ID, 458-462, 470-473; MSU ID training program, 554-559; of systems approach, 81; women in ID, 571-576
Home study package, 478
Honest communication in consulting, 277-279
Horizontal vs. vertical structures in schools, 23
Hierarchical structures in systems, 22-28
Hierarchies, in human development, 24-25; in subject matter, 24
Human as information processing system, 113-115
Human development, hierarchies in, 24-25
Human engineering, definition, 471
Human perception, history of theories of, 113-115
ID, anthropology and, 348-358, 395; applications of, 431-510; as art, 596; as efficiency and effectiveness, 9-11; as program emphasis, guidelines for, 400-401; as science, 1-5; as technology, 8-9; business/industry and, 496-500; career fields in, 547-548; cognitive psychology and, 126-137, 149-166; conceptual nature of, 1-5, 8-17; definition, 83, 395; ethics, 13; evaluation, 311-340; guided decision-making in, 180-197; guided field-experience in, 540-541; history of, 470-473; IIA's and, 394-402; implications of anthropological culture analysis for, 355-357; information processing theory and, 149-166;

integration with media services, 437-440; interface analysis and, 94-107; international, 432-454; international, case study of, 437-440; liberal arts and, 420-429; libraries and, 501-508; logistics of, 311-346; management of, 465-466; meaning and, 126-137; naturalistic inquiry and, 333-340; neurological science and, 595; paradigms and, 13; potential for, in liberal arts, 422-424; profession, as a, 595; professionals, skills needed by, 513; programs, emphasis in, 398-400; projects, evaluation of, 380-392; promotion of, in liberal arts, 420-429; public schools and, 501-508; range of action for, 8-9; relation to rest of instructional world, 29-39; sociology and, 595; split-brain theory and, 139-147; staff relations and, 341-346; state of the art, summary of, 593-596; strategies, 414-419; strategies for the survival of, 71-79; task environment of, 298-299; terms used in, in business/industry, 496; traditional, as program emphasis, 399; triune brain theory and, 146-147; types of problems dealt with by, 15-16; underlying sciences of, 1-5
ID-Consultant Utilization Matrix, 295
ID'ers, competencies needed by, 499-500; relationship with media production staff, 341-346; tasks performed by, list of, 298
IDD, see ID
Identifying instructional outcomes using SPInPrOM, 160-167
Ideosyncratic adaptive models, 233-235
IIA, activities performed by, 394; choosing an emphasis for, 394-402; factors determining emphasis, 396-399; in higher education, 414-419; nature of, 394-395; outside consultants and, 398; program emphasis of, 394-402; staff size and capabilities, 397-398; survival of, conclusions concerning, 71-73
Incentives, faculty, 415
Increments, size and sequence of, 483
Individual, as a system, 19-20
Individual differences and ID, 594-595
Individualized instruction, 225-230; and learner control, 225-230; models of, 88-89
Individualized instructional systems, 228-229; comparison of, 228-229
Inductive training, in cultures, 436
Industry, ID in, 496-500; state of the art of, 497-499
Infants, perception by, 114-115
Informal vs. formal education, 351
Information, capacity of nervous system, 116-117; generators, 105; intake, and the brain, 139-140; minimally essential, 105
Information processing, memory-perception model of, 113; perception and, 112; simultaneous vs. sequential, 123-124
Information processing psychology, 111-125, 149-166; literature of, 123-124
Information processing system, human as, 113-115; overload of, 119
Initial client-consultant conference, 289-293; assumptions of, 290; contracts and, 291; danger signals in, 291-292; expectations, 290; reasons for, 289-290; reinforcement in, 291; skills needed in, 289
Initiation phase, in change, 384
Innovations, advocates of, 355; anthropology and, 348-358; definition, 354; disappearance of, 359; ideological change and, 354; purchase of, 401; readiness for, 396-397
In-service teacher education, USSR, 446-447
Institute of General and Educational Psychology, 447
Institute of Problems of Higher Education, 450-451
Institute for School Equipment and Educational Technology, 444-447
Instruction, cognitive psychology and, 175; complexity in, 173-175; computers and, 172-175; conversational approach to, 174-175; definition, 31-32; design of, and split-brain theory, 139-147; purchase of, 401; relation to OD, 33-35; relation to SD, 31; types of, by cultures, 436; validating, 488-489; world of concern to ID, 31-32
Instruction/teaching/learning models, reviewed, 85-86
Instructional Design and development, see ID
Instructional designs, 169-274; basis in theory, 111-168
Instructional developer(s), see ID'er
Instructional development, see ID
Instructional Development Institute Model, 98
Instructional Improvement Agencies, see IIA
Instructional increments, size and sequences of, 483
Instructional materials, developing, 486
Instructional media, selecting, 484, 486-487
Instructional methods, selecting, 483-484, 487
Instructional outcomes, identification using SPInPrOM, 160-167
Instructional product development technology, 325-326
Instructional Program Development Centers, see IPD Centers
Instructional Simulation Design Methodology, 52
Instructional strategies and social issues, 46
Instructional systems, evaluation of, 490; models of, 80-91
Instructional systems development, see ID
Instructional tactics, 109-110
Instructional techniques, 343
Instructional technology, 29-30, 82-83; projected developments in, 580-582
Instructional value of display, 231
Intelligent CAI, 175
Interactive learning, 250-261
Interactive teaching, 250-261
Intercultural communications, 435-437
Intercultural communications, training in, 436
Interface, characteristics, 97, 105-106; functions, 104-105; plot, 104; priorities, 107; relation to systems approach, 97-98; structure of, 95-96; types of, 96-97
Interface analysis, definition of, 94-95; ID system and, 94-107; need for, 104-105; overview, 94-95

Internal evaluation, 490
Internal style, of data analysis, 285; of information processing, 284
International consulting, case study, 437-440; communications problems in, 435-437; conclusions concerning, 440; permits, 435; project management in, 435; rewards of, 440; special problems in, 435; staffing, 435
International organizations using consultants, addresses of, 433-435
International travel, 435
Interpersonal skills, training in use of, 286-287
Interrelationships among systems components, 22
Inter-service ID Model, 458-459
Interviews, in Air Force ID, 375-378
Intrinsic programming, 174
Intuitive, decision-making model, 283; style of information evaluation, 283
Involvement in international consulting, obtaining, 433-435
IPD Centers, 459-460
ISD, see ID
Isolation, learner control research on, 236
Iterative nature of ID, 465-466
Jello, and AO's, 272
Job Performance requirements, 477
Joint certification for media personnel, 536-538
Joint Film Catalog, MSU and U. of Michigan, 555
Johari window, 277-279
Knowing, psychological basis of, 126-133
Knowledge, acquisition of, 126-137; delivery of, in future, 562; new sources of, 562; of results, 482
Knowledge Generation Methodology, 52
LA, see Levels of Aspiration
Laggards, 382
Languages, in intercultural communication, 436
Late majority, 382
Lazy-eye problem, 115
Leadership, contingency models of, 306; models of, 305-307; models, variables in, 305; research and consulting, 306-307; styles and consulting, 294, 307; transactional model of, 306
Learner analysis, 43-45, 341-342
Learner, and training organization in business, 497
Learner control, 221-242; conclusions concerning, 239; definition, 221; external vs. internal, 223-225; in CAI, 229; in individualized instruction 225-230; manipulation of, 222-223; model, 223-225; research, 235-239; systems of, compared, 229-230; types of, 221-222
Learning, and cognition, projections of developments, 582-587; and memory, 139-140; and performance, 485; and psycho-linguistics, 126-137; as culture change, 355; biochemical definition of, 144; by doing, in Air Force, 471-473; definition of, 144, 203; environment, analysis of, 342; environment, military, 463; heirarchies, 149-166; hierarchies and human development, 24-25; meaningful, 126-137; SPInPrOM and, 154, 159-160; strategies and media, 487; theory, 262-274; types of theories about, and AO's, 270-271
Lecture, 226-227; as teaching method, 177-202; evaluation of 184-185
Levels of, aspiration, 232; Domain of Cognition, chart, 156; Domain of Cognition, described, 156-159; effort, of ID'er, 298; functioning in formative evaluation, 313; involvement in ID, by LMC, 507-508
Liberal arts, and FD programs, 426; and ID, 71-79; 420-429; conclusions concerning ID in, 428-429; experimental proof of value, 425; funding opportunities, 427-428; new technologies and, 421-424; potential for ID in, 425-426; promotion of concept, 425-426; strategies for ID in, 72-73, 424-428
Libraries and ID, 501-508; ID in, recent developments, 501-502
Library Media Specialists, 501-502; conclusions concerning ID for, 505-508; diffusion of ID among, 504-505; ID training appropriate for, 505-508; tasks performed by, 502-504; training in ID, 504
Life-long learning, 589-590
Licensure, definition, 565
Link trainers, 461
Linkage agents, 359-360; Model of Diffusion, 360
Listening, in initial client conference, 290
Living-Learning center, 246
Locale, 144
LMS, see Library Media Specialists
Load, in games, 251
Locus of control, 230
Logistics, definition, 311; importance to ID, 311; of ID, 311-346
Long-term memory, 143-144, 154; storage in, 143-144; storage in, SPInPrOM Model, 154
Mager, objectives vs. Stahl's 165-166
Management, consultant programs, 400; international project, 435; military, of ID, 465-466; models of, 87-88; of development process, 41-43
Manipulation, learner control and, 222-223
Materials, development of, 488; Evaluation Form, 412-413
Meaning, context and, 126-137; understanding, 126-133
Meaningful learning, 126-137; 262-274
Mechanisms and resources of change processes, 353-354
Media, design of, 134-137; learning strategies and, 487; Personnel, Joint Certification for, 536-538; production, in SHOTSO, 445-447; production staff, relations with, 341-346; selection of, 484, 486-487; services, integrated, at SJSU, 405-408; USSR, 441-454
Megaprocess, definition, 157
Memory, learning and, 139-140; long-term, 143-144, 154; organization in, 119-121; pictorial vs. verbal, 116; protein and, 140; short-term, 143, 152; survival in, 153; utilizing information from, 154; working, 152
Message production, 344-345
Meta-analysis, in AO research, 269-270
Meta-cognition, 223
Metamethodology, definition, 52; description, 53, 364; steps in, listed 53-69

Methodology, 51-69; in consulting, research, 307; technology and, 8-9; vs. method, 51-52
Methodology for Teaching by Inquiry, 52
Methodology to Develop Humanistic Psychological Education Curricula, 52
Methodology in Linquistics, 52
Methodologies, history of, 52; review of, 52
Methods, selecting instructional, 483-484, 487
Meyers-Briggs Type Indicator, 595
Michigan State University, curriculum development at, 559; early program in ID, 555-556; future of ID at, 561-563; history of ID at, 554-559; Joint Film Catalog, 555; origins of ID at, 557; training in ID currently available, 554-563
Micro-computers in military, 466
Military, cognitive psychology in, 467; consultants and, 467; educational technology in, 457-495; evaluation of ID in 465; future of ID in, 466-467; management of ID in, 465-466; motivation through ID, 464; problems of ID, conclusions, 466; selection of objectives in, 463-464; shift to individualized instruction, 460-461; strategy of instruction in, 464; task analysis in, 463; training accomplishments, 458; training, budgeting of, 462-463; training, devices, 461-462; training, history of, 458-462; training, problems in, 457-458; triviality of objectives in, 463-464
Minimally essential information, 105
Minority Student Affairs, Office of, 247
MNE, 232
Model(s) (of), Active Context Development, 38; adaptation of existing, 90; Air Force ID, described, 473-495; archetypes, paradigms and, 11-13; conceptual nature of, 12-13; conclusions concerning, 91; consulting, 276-277, 296-298; Cybernetic, 35; Cybernetic/CIPP, 35-36; decision-making, 282-287; definition, in systems theory, 82; development processes for new, 90-91; diffusion, 360-361; evaluation, 88; generality of, 230; Generalized Systems, 30; ID, 29-39, 341-346; ID systems, characteristics of 83-85; Individualized/computerized instruction, 88-89; Instructional Development Institute, 98; interface analysis, 98-101; IPISD, 459-460; leadership, 305-307; management, 87-88; memory-perception processes, 113; needs assessment, 88; research needed, 91; selection criteria for, 89-90; self-centeredness, 30-31; Shannon-Weaver, 96; simulation/gaming, 89; SPInPrOM, 150-155; synthesis of existing, 90; teaching/learning/instructional, 85-86; traditional ID, 506; training programs in consulting, 286-287; types, 82; Universe of Learning, 31
Model switching, by consultants, 289-300
Modes of instruction, 343
Momentary need for efficiency, 232
Monitoring of client-consultant relationship, 292
Motivation in military training, 464
Motivational context, 232
MSU, see Michigan State University
Multi-channel learning, 122-123
Mustard, Teaching the Cat to Like, 448
National Society for Performance and Instruction, 594; and certification, 568-569
Naturalistic Inquiry, 333-340
Naturalistic Inquiry, advantages of, 335-337; advantages to ID, 337-338; characteristics, 335-337; consequences of, 338-339; use by ID, 335-339
Nature of ID as a concept, 16
Navy IPD Centers, 459-460
Need for Interface analysis, 104
Needs Analysis game, 253
Needs Analysis Methodology, 52
Needs Assessment, models of, 88
NEOMYCIN, 467
Nervous system, information capacity of, 116-117
Networks, 595
Neurological sciences and ID, 595
Neutrality vs. empathy, in consulting, 281
New knowledge sources, 562
NII SHOTSO, see SHOTSHO
Nonarbitrary, definition, 266
Non-inidvidualized instructional systems, 228-229; comparison of, 226-228
Non-verbal communication, in initial conference, 290
NOPT, 451
NOT, 451
Number of displays, research on, 236
NSPI, see National Society for Performance and Instruction, 594
Number and use of subjects in formative evaluation research, 322-323
Objective and subjective paradigms in ID, 13
Objectives, behavioral, writing, 160-166; evaluation and selection of, 463-464; identifying, 342-343; in text, see Adjunctive elements; levels of, 480; Mager vs. Stahl, 165-166; selection of, 463-464; sources of, 480; specifying, 342-343; triviality of, in military, 463-464; writing, using SPInPrOM, 160-167
Occupational Measurement Center, 476
Occupational survey, 476
OD, 42
OD, as program emphasis, guidelines, 400-401; definition, 33-34, 395; its relation to instructional world, 33-35; relation to SD, 245-246
Off-the-shelf instruction, 498
Office of Minority Student Affairs, 247
OMSA, 247
On-the-job training, 478
Ontario Society for Training and Development, 499-500
Open communication, in consulting, 277-279
Open systems, 20-22
Opinion leaders, 382
Operationalization of Fuzzy Concepts Methodology, 52
Operationalized, defined, 365
Optimization, in General Systems Theory, 25
Organization in memory, perception, 119-121
Organization of Prose, 208-209
Organizational Development, see OD

Organizational Features of text, 210-215
Organizational Renewal, 400
Organizations, international, using consultants, 433-435
Organizers, advance, see advance organizers
OSTD, see Ontario Society for Training and Development
Orientation of ID programs in higher education, 415
Overlearning, 144
Overload, by information, 119
Pacing, planned, 482
Paradigms, archetypes and models, ID as, 8-17; conceptual nature of 12; definition, 1; in ID, and models, archetypes, 11-13; in ID, subjects vs. objectives, 13; ethics in ID and, 13; of ID, 13-15; underlying sciences of ID and , 1-5
Participation, active, by students, 482
Participatory Needs-Analysis Methodology for Community Planning, 52
Patterns of women, paralleling professional practice, 571-575
PEPA, Planning for the Evaluation of Programs and Agencies (questionnaire) 75-79; guidelines for using, 73-74
Perception and instruction, 126-137; as information processing, 112; multi-channel, 122-123; of roles by faculty, 415; organization in, 119-121; programs to guide, 114; theory, classical, 112; transfer across systems, 121-122
Perceptive individuals and information gathering, 283
Perceptual, register, 151; set, 150; systems, 112
Performance, 231; deficiency, determining, 42; definition, 481; evaluation of, 345; gaps, 387; related to learning types, 485
Permeability, of interface, 97
Permits, for working in international consulting, 435
Personal construct theory, 582-583
Personal security in consulting relationship, 292
Personalized system of instruction, 585
Personnel, preparation of, in ID, 511-569
Peter the Great, 448
Physical fidelity, 461
Physician/Patient Model, 276
Pictorial, information handling, 142-143; vs. verbal memory, 116
Pigeonholing, 117-119
Planned change, classic Models of, 383-384; evaluation of, 382-383
Planned change model, of diffusion, 360
Planned culture change, 348; and education, 351-352
Planned pacing, 482
Planning for Evaluation of Programs and Agencies Questionnaire, see PEPA
Planning instruction in Air Force, 494-495
Planning of social interactions, 41
Plot, interface, 104
PMAC, Premedial Academic Consortium, 247-248
Posttest data informative evaluation research, 322
Potential for ID in liberal arts, 422-424
Pre-assessment in ID, 341-342
Pre-operational stage, 265
Precision management of instruction, 585
Precision teaching, 585
Preparation of ID professionals, 512-596
Preparing for overseas jobs, 433, 435
Prescription Model of consulting, 276, 296-297
Pressey and programmed instruction, 169
Pretests, 482
Primary presentation forms, 235-236
Principles of learning, list, 159-160
Print, research on, 203-220
Priorities, interface, 107
Problem orientation in consulting, 281
Problem-solving, archetype and ID, 14; model of diffusion, 360
Problems and paradoxes in ID, 414
Problems, in international consulting, 435; in military educational technology, 462-466; of Higher Education, Institute of, 450-451; of ID in higher education, 414-419; of IPISD Model, 462-466; of professional preparation, 536; types of dealt with by ID, 15-16; with Air Force ID, 494-495
Procedures for formative evaluation, 326-329
Process, as focus of evaluation, 380-381; for creation of new systems models, 90-91; product vs., 177
Process evaluation, 380-381
Process Model of consultation, 276, 297
Producing resources, 344-345
Product development, formative evaluation and, 320; vs. instructional design, in industry, 496
Product Model of consultation, 296
Profession, criteria for, 512; definition of, 512; ID as a, 595
Professional, Practice, women and, 570-571; preparation, problems, of 536; status, of women, 570-571
Professionalism of women, and practice, 571-575
Professionals, certification of 534-544, 564-569; future directions in training of, 531-532; preparation of, 512-596; women as, conclusions concerning, 575
Programmed instruction, 319-320; as product and process, 169-172; basis of, 169-172; characteristics, in Air Force, 470-472; history, 169-172; in USSR, 451
Project management, international, 435
Promotion, of ID in liberal arts colleges, 420-429; of liberal arts concept, 425-426
Prose passage structure and substructure, 208-210
Protein and short-term memory, 140
Provisionalism, in consulting, 281
PSSC Physics, 356
Psycholinguistics and learning, 126-137
Psychological freedom, 280
Psychological safety, 279-280
Public schools, ID in, 501-508
Purchasing Model, 276
Qualification Raising Program, 449
Qualification raising, USSR, faculty, and, 449; on local level, 449; organization, 448-449; problems with, 450; scope of, 453

Quality control of training and certification, 451-453
Quasi-experimental designs and ID, 334-335
Questions, in text, see adjunctive elements
R & D Model of Diffusion, 360
Range of Action, for ID, 8-9
Rational decision-making model, 283
Reaction to events, spontaneous style, 284; systematic style, 284
Readability, as interaction, 207-208; formulae, 207; of text, 205-208
Readiness, and FD, OD, ID, 395; faculty, case study, 404-413; for innovation, and IIA, 396-397; variables contributing to, 396-397
"Real" problem, in consultation, 292
Reasons for initial client conference, 289-290
Reception, learning, 263-266
Reception, Theory and AO's, 271
Reflex, conditioned, 118
Reinforcement, 482; of client initial conference, 291
Relation of ID to instructional world, 29-39
Relations, client-developer, 275-309
Relationship, client, 275-309; of FD, ID, OD to each other, 395-396; staff to ID'er, 341-346
Renewal, organizational, 400
Requirements, definition of, Air Force ID, 478-479
Research, brain, 139-147; consulting, 300-307; formative evaluation as topic, 320-324; learner control, 235-239; needed on systems models, 91; USSR, on education, 443
Resistance, to change, 386-388
Resource, allocation, 344-345; requirements, determining, 486
Response, Activator, 155; correctness of, 231
Retrieval, from memory, in SPInPrOM, 154
Rewards, learner control research, 239; of international consulting, 440
Role expectations, intercultural, 436
Roles, faculty perception of, 415; in adoption, 381-382
Safety, psychological, 279-280
San Jose State University, 404-413; history of media services, 405-408
SAT, 458
Schema theory, 119
Schemata, 119
Schools, cooperation vs. competition, 25; public, and ID, 501-508; vertical and horizontal structures in, 23
Science, and technology in USSR, popularity, 453; applied and pure, 172-173; definition, 1; ID considered as, 1-5
Scientific basis for educational technology, 124
Scientific Organization of Educational Work, 450-451
Scientific Organization of Work, 451
SD, see Student Development
Selecting, media, 484, 486-487; methods, 483-484, 487; resources, 344-345
Selection, and evaluation of objectives, 463-464; criteria for models, 89-90
Selectivity, in interfaces, 97
Self-appraisal, faculty, 404-413
Self-centeredness, in models, 30-31
Sensory effectors, 151, 155
Sensory receptors, 151
Sequence of instructional increments, 483
Sequential vs. simultaneous information processing, 123-124
Set, of consultants, 299
Short-term memory, 152; pitfalls of, 143
Short-term storage and protein, 140
SHOTSO, 444-447
Simulation, models of, 89
Simulators, in military, 461
Single-channel hypothesis, 122-123
Sixteen PF, 595
Size of instructional increments, 483
SJSU, see San Jose State University
Skills, generic, 523; list of, in consultation, 289; needed by ID'ers, 513-515, 521-527
Skinner and programmed instruction, 169
SME, see Subject-Matter Expert
Social implications of technical interventions, 40-48
Social interaction model of diffusion, 360
Social intervention issues, conslusions concerning, 48; evaluation and, 46-47; in ID, 40-41; instructional strategies and, 46
Social systems, intercultural, 436
Social trends, and demand for ID, 587-590; in the sciences, 588
Socialization, definition, 351
Sociology and ID, 595
SOCRATIC, model, 229
SOPHIE, 175, 466
Sophisticated Instructional Environment, see SOPHIE
Specification of strategies, and social issues, 46
Specific skills approach to ID training, 513-521
Speech comprehension, 114
SPInPrOM, learning principles from, 159-160; model, discussed, 149-166; summary, 164-165; teaching of, 155
Split-brain theory, 139-147; functioning of 140-143; ID strategies from, 144-146
Spontaneous style, of data gathering, 284; of decision-making, 284
Spontaniety, in consulting, 281
Stability, interface and, 97; systems and, 26-27
Staff problems when small, 400
Staff procedures in formative evaluation, 329
Staff relationships and ID, 341-346
Staff size and capabilities in IIA's, 397-398
Staffing of international consulting projects, 435
Stages, of consulting relationship, 277; Piaget's, 265-266
Stahl, objectives writing, vs. Mager, 165-166
Stahl Perceptual Processing and Operations Model, see SPInPrOM
Standardized, definition, 365
State of the Art of ID, business/industry, 497-499; summary of, 593-596
Stereotypes, 436
Storage, contextual, 144; long-term in SPInPrOM, 155
Strategies, designing of, 343

Strategies, ID, 414-419
Strategies involving, cognitive learning theory, 159-160; higher education, 417-419; IIA's, 72-73; liberal arts, 72-73, 424-428; split-brain theory, 144-146; triune brain theory, 146-147
Strategy, guided decision-making as teaching, 178, 180
Strategy, instructional, in military, 464
Strategy vs. spontaniety, in consulting, 281
Strategy training in learner control research, 237-238
Stress, 595
Stroking of client, 292
Structure, of education in USSR, 442; of prose, 208-210
Structures, hierarchical, 22-28; vertical and horizontal, 23
Student, attitudes toward instructional improvement, 417-419; changes in characteristics of, 421; changes in programs selected by, 420-421; conflict of interest with faculty, 416; display performance, 231; estimate of comprehension, 231-232; participation, active, 482; performance, 231
Student Development, 243-249; cases of, 246-248; conclusions concerning, 248; definition, 31, 243-244; FD and, 33; methods, 246; need for, 244-245; relation to ID, FD, and OD, 245-246; relation to instruction, 31
Student Development Center, Fayetteville, 246-247
Subject-matter expert, business and, 498; consultant and, 254-295, 298; definition, 294
Subject matter, hierarchies in, 24
Subjective vs. objective ID paradigms, 13
Substantive, definition, 266
Substitution, 354
Sub-structure of prose, 209-210
Success in Air Force ID, 493-494
Supporting knowledge and skills, 480-481
Survey test, 481-482
Survival of, ID centers, 71-72; ID in higher education, 71-72; IIA's, 71-72
Survival training programs for international consultants, 436-437
Switching among models, by consultants, 299
Syndrome X, 30-31
Syndrome Y, 30-31
Synergism, 22
Synthesis of existing models, 90
System, definition, 80-81, 95
Systematic, definition, 9, 82; style, of decision-making, 284-285; style, of evaluation, 283
Systematized, definition, 365
Systemic, definition, 9, 82
Systems, components, interrelationships among, 22; generalized models, 30; hierarchical structures in, 23-28; interface analysis of, 94-107; introduction to, 80-81; open vs. closed, 20-22; research needed on models of, 91
Systems analysis and General Systems Theory, 18-19
Systems approach, concepts of, 81; described, 81-82; history of, 81; to training, model of, 458
Systems Theory, General, see General Systems Theory
Tactics, instructional, 109-110
Tactile information handling, 143
Task analysis, 45, 463; cognitive, 172-173; learning environments and, 463; LMS and, 504; military, 463
Task Analysis Survey Instrument, 502
Task environment, consultation and, 299-300; of ID, 298-299; of teacher in meaningful learning, 266
Taxon system, 144
Taxonomy, conditions to be met by a, 150
Teacher education, in-service in USSR, 446-447
Teaching aid, definition, 355
Teaching and learning, anthropological analysis, 352-353
Teaching strategy, guided decision-making as, 178, 180
Teaching the Cat to Like Mustard, 448
Team leader style, consulting, 299
TEC, 460
Technologies, new, and liberal arts, 421
Technology, definition, 8; educational, 29-30; educational, in USSR, 441-454; ID as, 8-9; instructional, 29-30; methodology and, 8-9
Tests, 481-482
Text, research on the design of, 203-220
Textbooks, 227, 595
Thinking, types of, 584
Thought, new patterns of, 589
TICCIT, as learner control system, 230
Time, instructional, 231
TOPICS, in conversational programming, 174
Training, Air Force, concepts of, 470-495; analysis and design, 462-463; certification and field experience, 540-541; certification and quality control, 541-543; consultation skills and, 285-287; development of in Air Force model, 473-475; extension courses in Army, 460; history, Air Force, 471-473; history, military; 458-462; in ID at FSU, 545-553; in ID at MSU, 554-563; in ID and naturalistic inquiry, 338-339; in intercultural communications, 436-437; military, conclusions concerning, 467-468; military devices, 461-462; need for in ID, 512-513; overview of military, 457-458; program for faculty, 398; standard, definition, 475
Transactional model of leadership, 306
Travel, international, 435
Trends in the future of military ID, 466-467
Triune brain, 146-147
Types of instruction, by cultures, 436; of interfaces, 96-97; of models, 82
Typologies, psychological, and consulting, 275-288
UCIDT, see University Consortium for Instructional Development and Technology, 558-559
Underlying sciences and ID, 1-5
Underlying skills, can they be taught?, 529; critique of ID programs using, 531; critique of use in ID training, 527-528; use of in ID training, 523-528

Understanding and meaning, 126-133
Uniprocesses, definition, 157; described, 158; listed, 158
University Consortium for Instructional Development and Technology, 558-559
University of Michigan, Joint Film Catalog, 555
Universe of learning Model, 31, 36
Unload, in games, 251
USSR, centralization in education, 442; computers, 451; educational technology, history, 443-444; educational technology, scope, 452-453; ID in, analysis of, 452; ID in, conclusions concerning, 454; ID in, direction of, 452-454; ID in, future of, 453-454; ID in, scope of, 452-453; misperception of American ID, 451-452; popularity of science in, 453; programmed learning in, 451; possibility of centralization, in ID, 453; Qualification Raising Program, 453; research in education, 443; structure of education, 442; teacher education, 446-447; traditions of higher education, 453; University Equipment, 447
Validation, of instruction, 488-489; of tests, 481-482
Values, in teaching and learning, 352-353; intercultural, 436
Variables, contributing to student performance, 231; in diffusion, 361-363; in leadership models, 305; model of, in diffusion, 363-364; weighting of, in diffusion research, 363-364
Variety, 173-174
Vasopressin, 586
Verbal vs. pictorial memory, 116
Vermont, University of, 246
Vertical and horizontal structures, 123
Visability, interface, 97
Vision, in control of human behavior, 115-116
Visual information handling, numbers, 141-142: pictorial, 142-143; words, 141-142
Window, Johari, 277-279
Within Program Posttest Performanc, research, 321-322
WKD/UI, see Wolf Knowledge Diffusion/Utilization Inventory
Wolf Knowledge Diffusion/Utilization Inventory, discussed, 366-367; displayed, 366-379; orientation to, 372-373; parts of, 373-378; scoring, 379
Wolf-Welsh Linkage Methodology, discussed, 365-367; steps of, 368-372
Women, and ID, 570-576; and professional literature, 571; and professional practice, 570-571; and professional status, 570-571; as professionals in ID, 570-576; history of, in ID, 570-576; patterns of professional development, 571-575
Words and numbers, handling of, 141-142
Workbooks, stylized, 227-228
Work, Scientific Organization of Educational, 450-451
Working memory, 152
Writing objectives using SPInPrOM, 160-167
WWLM, see Wolf-Welsh Linkage Methodology
Young Lecturers Schools, 450-451